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CIVIL ENGINEERING.

For the Journal of the Franklin Institute.

Grand Trunk Railway of Canada.

We have been favored by Captain L. A. Huguet-Latour, of Montreal, Canada, with a copy of the official statements, reports, and accounts of the railway aforesaid, laid before the Legislative Assembly, of Canada, in 1857, by Hon. W. Cayley, Inspector General.

Some points in this official document are well worthy of the notice of the engineering readers of our *Journal*.

This great work (now nearly completed) will stretch in a continuous line and with unbroken gauge, ($5\frac{1}{2}$ feet,) from Port Sarnia, at the outlet of Lake Huron, to the Harbor of Portland, in the State of Maine, forming with its Quebec branch, a connected railway of 1112 miles in length, all under an undivided management, and worked by a single corporation, with an investment already exceeding *fifty millions of dollars*.

We now invite attention to a few interesting items of detail.

1. *Renewal of Rails.* Upon the sections opened but recently, the replacement of broken and injured rails has already reached a ratio of 1 in 500—whilst upon those portions of the eastern section which have been in operation for six or seven years, the present annual ratio of replacement of rails is 1 in 30. The rails for renewals have been obtained under contract with a Boston rail-mill at £5 sterling (say $25,) per ton, the contractor supplying a ton of new for every ton of old sent to the mill, and the company bearing the transportation to and fro.

The Chief Engineer, (A. McKenzie Ross, Esq.,) thinks for the present, this arrangement cannot be improved, as far as concerns the Portland section; but for the 750 miles in Canada, where the ordinary wear and tear will require the re-rolling of 60 tons per week, or 3000 tons per annum,* he recommends the establishment of a company rail-mill, which, in his estimation, will save $75,000 annually.

2. *Lighting of the Central Work-shop.*—The gas for the 700 lights now required at the establishment at Point St. Charles, is furnished by the Montreal Gas Company, at, say $3 per 1000. The Chief Engineer considers this exorbitant, and recommends the Company to make their own gas, which he is confident they can do at $1·80 per 1000, or forty per cent. reduction, and that the cost of the necessary works would not exceed $20,000.

3. *Repairs of the Permanent Way*—Have been contracted for upon 856 miles of line, in eight contracts, to run three years each, at an average of something less than $500 per mile per annum, exclusive of iron, and in effect of bridges also—these being of a permanent character.

The above items are gathered chiefly from the Report of the Chief Engineer, and they indicate on the part of that skilful officer, a general opinion, that great railway corporations like the Grand Trunk of Canada, would find it to their interest to supply themselves with materials from manufactories of their own to a great extent.

We come now to notice a Report by Messrs. Keefer & Shanly, (engineers of the Grand Trunk Railway,) deputed to examine specially, the bridges of the eastern section, and, as it is almost wholly devoted to the *wooden bridges* of the Montreal and Portland Division, constructed chiefly by American engineers, it is valuable to us as a shrewd criticism, by two skilful Canadian engineers, (familiar with English works,) upon a certain mode of bridge construction, in common use on very many of the railways of the United States, and while we admit generally, the propriety of the observations made by these able officers, we will note for the consideration of our readers a few exceptions.

Of Wooden Bridges.—Upon the Montreal and Portland Division, (says this Report,) there are now 55 wooden bridges, in all, 9355 feet long—all, with a single exception, "Howe Trusses without arches."

These bridges at the date of this Report were from four to eleven years old—the earliest having been built in 1846, the latest in 1853.

"The old or first set of bridges are in various conditions of safety, or of insecurity, and demand constant and careful inspection to maintain them in a reliable manner.

"Those which were covered in shortly after they were built, are in a pretty good state of preservation. The painting and decking of others, without covering the sides, has been but *an imperfect protection;* but all of them were too lightly timbered in the first instance to endure for any length of time the great strain to which they are continually subjected, and for this reason, and in some instances from inferior workmanship and materials, have given indications of premature decay and failure.

*Experience in the United States on railways of active trade conclusively proves, that the above is an *under-estimate*, and that the quantity required for the annual replacement of 750 miles of railway, would, at an average, *far exceed* the amount stated.

"The *unprotected ones* have failed more rapidly, and some of them are now propped up on bents.

"The large bridge over the Richelieu, at St. Hilaire, was only painted and decked—not covered in—and although strengthened by an arc* two years since it is now in an unsafe condition, and should be replaced without delay. It was built in 1846, and had it been properly protected at that time, would have lasted many years longer.

"Several other bridges are in the same unsatisfactory condition, and must be re-built this season, (1857,) without loss of time. There are others, again, that must be replaced in one, two, three and ten years, and none of the old bridges, however well protected, can be expected to last more than five or six years longer, under the very heavy traffic which they will have to sustain.

"The condition of these bridges may be taken as a sufficient proof, that for the purposes of a first class railway—such as the Grand Trunk—*wooden bridges are but a temporary adaptation*, and should never be *replaced* with wood, except in cases of necessity, when, as in the present instance, (with regard to some of these,) it will be impossible to procure and put up *iron*, within the time they are absolutely required. *Unprotected bridges* submitted to heavy traffic, especially where coupled engines are used, will not last out *more than five or six years*,† and those *which are covered and properly cared for may last twenty years*;‡ but they are all liable to be burned up, and so for a time put a stop to business—which might cause more damage to the company on that account, than the entire cost of the bridge itself.

The Report goes on—

"We therefore consider it the interest of the company, and strongly recommend that arrangements should be made for having all *the wooden bridges* replaced by iron tubes or girders.

"Taking the whole line through, the cost of iron bridges will be (on 7835 feet run,) a little more than *double* that of wood, but in the single instance of the Richelieu bridge the cost will be a little less than *three times*.

"There are some bridges, however, which must be rebuilt at once in wood, and for these, we consider the best form for strength and durability is the '*Burr arch and truss bridge*.' It is a form which has stood the test of time, and is generally acknowledged to be the most reliable and satisfactory. No (wooden) truss of large span is suited for railway purposes, unless combined with the *arch*, and the condition of the bridges on this line may be considered as confirmatory of this statement."

In concluding these extracts from the brief but able Report of Messrs. Keefer & Shanly, (Canadian engineers of reputation,) we desire to add a few remarks upon the last paragraph, in which we fully concur.

While a majority of our American engineers will undoubtedly endorse the "Burr Bridge," and nearly all allow the *utility of arches*, yet we see very many of these gentlemen admitting in their works, flimsy rectangular trusses (without arches,) under various patents, which their judgment can hardly approve, and which we hope may be more generally condemned in future, by the body of our engineers—as they have already been by many of the most enlightened members of that honorable and useful profession. M.

*It is a singular fact, that although the American engineers have always promptly resorted to "*arches*" to sustain a falling bridge, many of them have manifested an inconceivable repugnance to the use of "*arches*" as an integral portion of original structures.

†To this observation, we regret we cannot assent—a properly constructed bridge of suitable materials, even if *unprotected*, except by *white-wash*, may be fully relied on for *ten years*, and we could point to a light "Howe Truss," built of Susquehanna white pine, (in use upon a railway,) now twelve years old, and yet in fair condition.

‡There are so many instances of much greater durability of covered bridges in the United States, that this proposition cannot be acquiesced in. "*Burr Bridges*," properly constructed and carefully covered, have been in use with double track railways and heavy trade for *twelve years*, and show not the least symptom of failure—while the famous bridge at Trenton, on the Delaware, (in spans of 200 feet,) was built fifty years ago, is still in excellent order, and for a dozen years has borne a railway track!

For the Journal of the Franklin Institute.

*On the Absolute Power of Steam, and the most Convenient Method of Ascertaining it; more Particularly in Reference to its Effective Working, when applied Differentially in the Steam Engine, and Condensed with Hot Water.**

By Thomas Prosser, Civil Engineer, New York.

The power of steam is to the multitude like that of some mythic gnome, unlimited; while, in the books, it is so overlaid with formula, as to be little better than a myth to ordinary engineers, who are seldom familiar with mathematical calculations, and have not the patience to await the unravelment of a long string of x's, y's, and z's. How else are we to account for the numerous inventions, even of tolerably well educated men, which promise impossibilities in the way of using steam, which promise to obtain from it more mechanical power than exists in it? There are innumerable instances of such inventions, which, had the inventors been aware of the absolute power of steam—beyond which it is impossible to go—would never have been heard of.

That the knowledge required, is in the books, may be true, but it is not made manifest, and the elaborate tables are more calculated to mystify than to place the fact in bold relief.

We are supposed to know something about the weight of water which one pound of coal will evaporate—that is something—it varies, perhaps, between 5 and 9 lbs.—not very definite truly, but according to Mr. McElroy, Vol. xxxv, p. 239, of this *Journal*, it is questionable if the range is wide enough, for, coal used for *experimental purposes*, appears not unfrequently to have been taken by the *barrow full*, for a bushel, and again transposed, and called so many pounds. 84 lbs., according to Farey, was usually considered a bushel; then it got to be 88 lbs. in calculations, and now it is 94 lbs., or somewhere between 80 and 112 lbs. Again, the evaporation of the water has usually been calculated from the capacity of the cylinder of a steam engine, which gives no record of the steam which is condensed therein. And this, then, is the *practical* way of testing the power of a steam engine and boiler—the steam being measured by the *cylinder full*, and the coals by the *barrow full*.

Now, it appears to me, that what is required is a "*standard*," which readily conveys to the mind something definite, so far as our present knowledge extends of the absolute power of steam. For instance, one pound of water converted into steam under a certain weight, expands and lifts that weight so many times its own height. Here we have the absolute power *put into* the water to convert it into steam, and of course we can obtain no more out of it. If the height of the pound of water is one foot, then the product of the weight lifted in pounds on that "Standard Base," by the height which it is carried in feet, (being equivalent to the volumes of steam which one volume of water is converted into,) gives the "Standard Power." Mr. McElroy, before

*More fully explained in Volumes xxxi, xxxiii, xxxiv, and xxxv, of this Journal.

referred to, has shown how little reliance can be placed upon the Cornish pumping engine's returns of the duties of the coal. He has omitted, however, to state the expansion with which the Brooklyn pumping engine is intended to work, to give a duty of "600,000 lbs. raised one foot with one pound of coal." That knowledge is necessary, because the whole mechanical power in the steam, deducting the ordinary back pressure in the condenser, is but about equal to the effective power guaranteed, providing that one pound of coal evaporates 10 lbs. of water, which is very improbable. Even this amount of duty is but about the average reported of the Cornish engines, and some reports have even exceeded twice as much. Without knowing with what expansion the engines are worked, it is not possible to tell whether the duty reported exceeds the power of the steam or not. The tables now in use are not sufficiently correct for the purpose to which I have intimated a desire to apply them, as more than fifty years have elapsed since the experiments were made, which constitute the basis of our calculations of the density of steam. Since that time, other experimentalists have entered the same field of science, and foremost among them we place M. Regnault,* who has proved, beyond any reasonable doubt, that the whole basis is very considerably in error as regards the relations which the temperature bears to the elastic force of steam; and also, that the dilatation of dry gaseous bodies, and by inferences of dry steam also, varies from the received standard sufficiently to require the compilation of a new table, which is here presented.

The ratio of the pressure as compared with the temperature of steam, will be found to increase considerably more than the tables now in use assign, and the correctness of this position is confirmed by the experiments of Magnus. On the other hand, the dilatation is reduced by the experiments of M. Regnault. And this, together with the weight of a litre of dry air, is all the additional data which we have on which to base the new calculations. We have, therefore, nothing but the old and well-known formula, $\left(\frac{p}{t+x}\right)$ to go by. By this the tables at present in use have been calculated, and the value of x, as obtained from the experiments of M. Gay Lussac, is 480° F., hence, $\left(\frac{p}{t+480}\right)$; 480 being the number of degrees above 32° F., to which dry air is required to be heated to double its volume.

The same formula becomes $\frac{p}{t+272{\cdot}47905}$ by retaining the original basis (the centigrade) of calculation. The new table extends to the limit of M. Regnault's at the end of his ninth Memoir, and embraces each decade of the centigrade from 0° to 230°.

In addition to the temperature by the centigrade, the pressure in atmospheres, and the total heat above 0° C., I have shown the cor-

* Memoirs of the French Institute, Vol. xxi, 1845.

responding temperature, and the total heat by the Fahrenheit scale, the pressure in lbs. per square inch, and in inches of mercury.

I have also calculated by the formula before mentioned, the expansion of a volume of water at 62° F.,* by vaporization under the different pressures; also the number of cubic feet of steam required to weigh one pound.

But the most important addition, I consider to be the 8th column, which represents the duty of one pound of water just as the duty of one bushel of coal is represented by the returns of the Cornish engineers.

The "conclusion" which M. Regnault arrived at from his experiments on the dilatation of the elastic fluids, is, that, when the co-efficient of dilatation is derived from their expansion between 0° to 100°, while the elastic force remains constant, it is 0·3670, or 1 in 272·47905† for each degree above 0° C., corresponding with 1 in 490·463 for each degree above 32° F.

The same authority informs us that a litre of dry air under the ordinary pressure of the atmosphere, and at 0° C., (32° F.,) weighs 1·293187‡ grammes, which gives ·08063563 lbs. per cubic foot. Therefore, by calculating the decreased density of air by the law of Bogle and Marriatte, we have ·0589873 lbs. as the weight of one cubic foot of air at 100° C., under the ordinary pressure of the atmosphere.

There are no reliable experiments that I know of, which give the absolute weight of steam, for although M. Regnault promised to investigate the subject, I believe that he has not yet done so; and therefore we have to resort to M. Gay Lussac's ratio of ·62349, air being 1, and both at 100° C., (212° F.,) at which temperature one cubic foot of steam weighs ·036778 lbs.

Finally, taking the weight of 1 cubic foot of water at 62° F., at 62·321 lbs., we have 1694·48 cubic feet of steam at 212° F., produced therefrom.

And 100 cubic inches of steam at 212° will weigh 14·89849§ grains, while at 32° it will weigh ·123269 grains instead of, as formerly assumed, 14·96 and ·13716 grains respectively.

If this table is favorably received, I hope at some future time to extend it to every degree of the centigrade, and I cannot forbear expressing the hope that ere long no other thermometer will be in use.

If engineers, instead of taking the square inch, will take 2·31162‖ square inches for the base on which the pressure of steam is measured, call it the "*Standard Base*," and say so many pounds pressure per "Standard," *i. e.*, a base of water which at 62° F. weighs one pound for one foot in height, it will very much simplify calculations, and tend to give a clearer conception of some of the most important properties of steam.

* In case the new system of condensation becomes universal, and of which the writer has not the slightest doubt, the temperature of the water should be taken at 212° F., as it will always enter the boiler at about that temperature or rather above it. In this case, one cubic foot of water will weigh exactly sixty pounds, and the "standard base" will be 2·4 square inches, (= 144″ ÷ 60.)

† The experiments of M. Gay Lussac which have heretofore been accepted and relied upon, give ·365, or 1 in 266·666 for each degree above 0° C., corresponding with 1 in 480 for each degree above 32° F.

‡ M. M. Boit and Arago calculated this at 1·299541 grammes.

§ Troy grains, of which there are 7000 to the pound avoirdupois.

‖ But see a previous note, wherein 2·4 square inches is proposed.

TABLE

Of the Temperature, Elastic Force, Weight, Volume, Mechanical Power, and Total Heat of Steam for every decade of the Thermometer from 0° to 230° Centigrade.

One pound of water at 62° F., resists conversion into steam with a force equal to lifting it in height.

One volume of water at 62° F., converted into steam occupies in

One pound of steam in

It is the absolute mechanical power forced into the water during its conversion into steam.

Temperature.		Elastic force lbs. per square inch.	Elastic force per Standard Base.	Elastic force in inches of merc.	Elastic force in Atmospheres.	Cubic feet.	Volumes.	Feet standard power.	Total heat above.	
Centigrade. Deg.	Fahrenheit.								Fahrenheit 32°.	Centigrade 0°.
0	32	·089	·20542	·1811	·006	3286·	204802·	42071	1091·70	606·5
10	50	·177	·40906	·3606	·012	1711·	106622·	43615	1097·10	609·5
20	68	·336	·77659	·6847	·023	933·	58150·	45160	1102·68	612·6
30	86	·610	1·4089	1·2421	·042	532·	33148·	46703	1108·26	615·7
40	104	1·061	2·4521	2·1618	·072	316·	19676·	48247	1113·66	618·7
50	122	1·778	4·1076	3·6213	·121	195·	12122·	49792	1119·06	621·7
60	140	2·876	6·6446	5·8580	·196	124·	7726·	51336	1124·64	624·8
70	158	4·505	10·409	9·1769	·306	82·	5080·	52880	1130·04	627·8
80	176	6·854	15·837	13·962	·466	55·	3436·	54424	1135·62	630·9
90	194	10·155	23·465	20 687	·691	38·	2385·	55968	1141·02	633·9
100	212	14·689	33·940	29·922	1·000	27·19	1694·48	57510	1146·60	637·0
110	230	20·784	48·023	42·338	1·415	19·73	1229·72	59056	1152·00	640·0
120	248	28·822	66·597	58·713	1·962	14·60	909·95	60600	1157·58	643·1
130	266	39·239	90·667	79·934	2·671	11·00	685·40	62144	1162·98	646·1
140	284	52·530	121 363	106·995	3·576	8 420	524·77	63688	1168 56	649·2
150	302	69·215	159·929	140·996	4·712	6·545	407·88	65232	1173·96	652 2
160	320	89·902	207·730	183·138	6·120	5·158	321·45	66776	1179·51	655·3
170	338	115·222	266·233	234·715	7·844	4·1176	256·62	68320	1184·94	658·3
180	356	145·850	337·003	297·107	9·920	3·3266	207·31	69864	1190·52	661·4
190	374	182·500	421·688	371·766	12·425	2 71713	169·35	71408	1195·92	664·4
200	392	225·914	522·001	460·204	15 380	2·24249	139·754	72952	1201·50	667·5
210	410	276·857	639·711	563·978	18·484	1·86859	116·452	74496	1206·90	670·5
220	428	336·106	776 612	684·672	22·882	1·57110	97·9124	76040	1212·48	673·6
230	446	404·447	934·523	823·887	27·535	1·33213	83·0198	77584	1217·88	676·6
0	1	2	3	4	5	6	7	8	9	10

NOTE.—Columns 3, 6, and 8, are new features in the table; the first (3) representing the pressure in pounds upon a base coincident with that of a column of water one foot high, which will weigh one pound. This base it is proposed to call the "*Standard Base*," to be used instead of the "*square inch*" now used for that purpose. Multiplying the pounds of pressure per "Standard Base," by the volumes into which the heat will expand the water in converting it into steam; (7) gives the next column, (8) representing the whole mechanical power of

the steam or the "*Standard Power*," which may be converted into horse power by being divided by 33,000.* Column 6 gives the number of cubic feet of steam which will weigh one pound. Columns 0, 5, and 10, are identical with M. Regnault's table at the end of his ninth Memoir, before referred to.

In applying this table to calculating the power of a steam engine working "differentially," according to the "*new method of applying and condensing steam*," I shall premise that any good oscillating engine will give out 82·5 ℔ cent. of the power of the unbalanced steam.

In the "Memoir," vol. xxxi, p. 343, of this *Journal*, I have mentioned a back pressure in the "differential" method of applying the power of steam, as if it formed a necessary part of the system, that such back pressure should greatly exceed that of the atmosphere, which is not the fact, indeed it is just the reverse; when steam from a high pressure steam engine exhausts into the atmosphere, the back pressure on the piston must necessarily be greater than is due to the mere steam itself, because it is constantly surging to and fro at every stroke with the whole weight of the atmosphere, whereas, in my method, the back pressure is that of the steam in the condenser *only*, which is always leaving the piston, and the quantity of the condensing water being properly regulated, the pressure in the condenser may be kept at the pressure of the atmosphere to the greatest nicety, and thus prevent any of that surging *into* the exhaust pipe by the atmospheric air, and the *bellowing* of the steam to get it out again.

The one is a mere statical pressure, while the other is a dynamic force of the very worst kind for the steady working of the engine.

In comparing the new or "differential" method of applying and condensing steam, with the ordinary high pressure mode of exhausting into the atmosphere, (irrespective of the recuperative power of the former method,) we have to consider the amount of the back pressure of the latter over and above that of the atmosphere, to which (viz: the pressure of the atmosphere,) the differential method may be confined with a certain economy, to the extent of that difference, whatever it may be.

If this simple but incontrovertible fact is established, viz: that the "differential" method gets rid of the surging back pressure of the atmosphere as a dynamic force, and converts that pressure into a mere static one equal to that of the atmosphere only, then the consequences are inevitable, for, say that there is no loss merely, and is it not clear that the economy of bringing into operation the recuperative power of the "differential" method must inevitably cause its adoption? Firstly, because any increase of back pressure† which may be required, causes the feed-water to become so much hotter, as to fully compensate therefor, and the boiler is supplied with hot distilled water at no cost what-

* In calculating the effective power at 75 ℔ cent of the total power in the unbalanced steam, this divisor becomes 44,000 (= 33, 00 ÷ ·75,; at 82·5 ℔ cent., it is 40,000 (= 33,000 ÷ ·825.)

† The back pressure is only necessary when distilled water is required, to obtain which, by any other means, involves the necessity of another boiler, to all intents and purposes as objectionable as those which it is the object of the surface condenser to remove, only, instead of having four boiler to blow off, but one is required, and hence, to that extent, there is a saving of engineer, but none of fuel, and none of boiler either, where copper tubes are used for the condenser while the boiler is of iron. See the February number of this Journal, vol. xxv. page 94.

ever, by means of which, its evaporative power and durability* are increased to an enormous extent. This consideration alone should settle the matter, for the known inefficiency of the air pump surface condensing steam engine, makes it entirely unnecessary to establish any comparison with it, but we may do so by way of making an example of the culprit.

Rule 1, for the "differential" method.

To ascertain the weight of steam required per minute for a steam engine of a given power, multiply the "*Standard Power*," (*i. e.*, the whole power in one pound of working steam in the cylinder,) by the pounds per "*Standard Base*" of unbalanced steam pressure, and divide the product by the pounds per "*Standard Base*" of working steam, and with it as a divisor, divide 40,000 times the horse power (H. P.,) required, and the product is the number of pounds of water per minute which must be converted into steam to furnish it.

To find the cubical contents of the cylinder in feet.

Rule 2. Multiply the number of pounds of steam as found by Rule 1, by the cubic feet in one pound of it by the table, and divide by the number of single strokes of the engine per minute, and the product is the capacity of the cylinder in cubic feet.

EXAMPLE I.—Required an engine of 3 H. P. to be worked with full steam of 160 lbs. per "Standard Base" of pressure of the working side, and 34 lbs. on the exhaust side of the piston = 126 lbs. of unbalanced steam, and making 400 single strokes per minute. Here we have 65,232 as the "Standard Power," corresponding with 160 lbs. per "Standard Base" of working steam, and 126 lbs. of unbalanced steam pressure.

Now, by Rule 1, $(65{,}232 \times 136) \div 160 = 51{,}370{\cdot}2$, which represents the power of the unbalanced steam with one pound of working steam in pounds raised one foot.

Also, $(40{,}000 \times 3) = 120{,}000$. And, $(120{,}000 \div 51{,}370) = 2{\cdot}336$ lbs. of water required to be converted into steam to supply 3 H. P. for one minute.

Again, by Rule 2, $(2{\cdot}336 \times 6{\cdot}545) \div 400 = {\cdot}382228$ cubic feet, or 66·05 cubic inches in the cylinder.

Therefore, if the length of the stroke be taken at 6″, the area of the piston must be 11 ins. or 3·6 ins. diameter.

We may calculate, that 50 lbs. of feed water, pumped into the boiler of a steam engine at the full boiling point, may be evaporated from 10 feet of recipient heating surface in one hour, by 5 lbs. of coal burned on $\frac{1}{8}$-th of a square foot of grate surface, and shall constitute one H. P., the unbalanced steam being equal to lifting 40,000 lbs., one foot high per minute. The steam shall be well dried and worked at full pressure throughout the stroke. The condensing water must be 200 lbs. or (4 times the weight of the feed water) of which 20 lbs.

*The durability of iron boilers is affected in a most extraordinary manner by cold water. Hot pure water appears to have but little or no effect upon it, except dissolving a little of the oxide, while cold water gives it the rheumatism, gets inside of it, and causes large flakes to peel off, whole lamina in fact. I have reason to believe that these remarks apply to some extent to sea water also, as they are well-known to apply to ordinary boiler water.

or ·10 of the whole, or 4 times the weight of the fuel consumed, shall be evaporated from the hot-well for the following purposes, viz:—

	lbs.	
Condensed,	2	to make up for the waste from the boiler.
	3	for any purpose that it may be required for.
Uncondensed,	15	to improve the draft of the chimney.
	20	

Here we have 50 lbs. of steam to condense, and 200 lbs. of water to do it with, but of the 50 lbs. of steam, 2 lbs. are allowed for waste, and 15 lbs. more is transferred to the 200 lbs. of condensing water, and goes off by the blast pipe in the shape of vapor, leaving but 33 lbs., (= 50—(2 + 15) of steam to be condensed by 185 lbs., = (200—15) of water, for the 15 lbs. is equally lost, both as to the latent heat of the steam, and as condensing water. The 3 lbs. of vapor which is taken from the hot-well, and is to be condensed by the same stream of water which it is taken from, is practically the same as taking so much of the hot water itself.

And so we have 5·606 lbs. = (185 ÷ 33) of the condensing water to condense 1 lb. of steam, and as the waste hot water which carries off the surplus heat runs away at 100° C., and the working steam at 150° C., has a total heat of 652·2°, we have, 552·2° (= 652·2—100) to run to waste, and 552·2 ÷ 5·606 = 98·5° gives the increase of temperature of the condensing water, which must therefore enter at 1·5° C., (= 100—98·5) to effect the condensation if no allowance is made for radiation.

Now, let us analyze the whole of these productions and ascertain what we have got of available property in them, premising 1st. That we obtain one H. P. from the combustion of 5 lbs. of coal per hour, the engine working without expansion.

That is all we bargained for and the rest is surplusage—therefore:

2d. An abundance of distilled water to make up for the waste from the boiler, the importance of which is not fully appreciated, or no mere subterfuge would be tolerated for one moment, and that is a mere subterfuge which does not effect its whole object.

3d. Distilled water for the use of a ship, &c.

(NOTE.—Altogether 5 lbs. or $\frac{1}{8}$-th gallon per hour for each H. P., is available for the above two purposes in ordinary cases.)

4th. 15 lbs. of vapor to improve the draft of the chimney, but if that is not needed, then it may be applied to the working of another steam engine, of the air pump condensing kind, and will give out 1·875 H. P.

(NOTE.—Taking the whole 20 lbs. of uncondensed vapor, the power obtainable from it is ·25 H. P., so that in point of fact, we can obtain 1 H. P. from the combustion of 4 lbs. of coal per hour, the engine working without expansion. Taking this statement as including all the advantages obtainable from the steam, there is still something left in.)

5th. $22\frac{1}{2}$ gallons per hour per H. P. of boiling hot water.

As to the areas of the condensing surfaces, my experience thus far assigns to the

Main condenser,	.	3·00 feet supl.
Heater "	.	0·75 "
Condensing surface,	.	3·75 feet per H. P.
Distilling condenser,		0·75
Condensing and distilling surfaces,		4·50 "

Finally. If the working steam is 100 lbs. per square inch of pressure above the atmosphere, and the back pressure is 6 lbs. above it, we shall have 1 H. P. from 43 lbs. of feed water evaporated by 4·3 lbs. of coal, or with an auxiliary air pump condensing engine to use up the whole of the low pressure steam, we shall obtain one horse power from the combustion of 3·44 lbs. of coal, and cutting off the steam at one-fourth of the length of its stroke will give one horse power from the combustion of 1·5 lbs., according to the usual mode of calculation, which, however, involves a great fallacy, for in this case, the advantage of cutting off at one-fourth of the length of the stroke will scarcely effect a saving of more than one-third of the fuel, and therefore 2·3 lbs. per hour per horse power is as low as can be calculated upon. The fallacious results usually arrived at in such calculations, arises from neglecting the space necessary for the clearance of the piston, as well as the steam in the passages, which even with such moderate expansion as allowed above is nearly half as much as the steam admitted.

I risk nothing in asserting that without expansion, the air-pump surface condensing engine will require upon the average not less than 90 lbs. of feed water per hour per horse power, and that, owing to the low temperature at which it must necessarily be pumped in, together with the ordinary scale upon the boilers, from having one-fourth of sea water in them, and the blowing off continually necessary, not more than 7·5 lbs. of such water can be evaporated with 1 lb. of coal, which shows that 12 lbs. of coal per hour is necessary on such a system, while 5 lbs. is sufficient on the new one.

The investigation which I have courted, will doubtless prove very tedious to any one who will take it up, but surely its importance should command some attention, if not as a mere theory even, at least as a successful result of several years' practical experience, both with salt and fresh water as the condensing medium.

In my next, I hope to be permitted, by the aid of a pictorial illustration, to show the modus operandi which I have adopted in carrying out the system, and also what becomes of the total heat in the exhaust steam, in such a manner as to defy all cavil, and assure the *unbelievers* that not only can steam be condensed with boiling hot water, but also that *more* distilled water "can be returned into the boiler than it evaporates." And, furthermore, that both are done daily, and the method by which it is done is simple in the extreme, and open to the inspection of all.

For the Journal of the Franklin Institute.

The High Pressure Jonval Turbine.

To the Committee on Publications.

GENTLEMEN:—I take the liberty of laying before the Committee, some facts relating to a High Pressure Jonval Turbine, planned by Mr. Emile Geyelin, of your city; which, owing to the great fall under which the turbine operates, will no doubt be interesting to the scientific readers of your *Journal*.

In the latter part of the year 1853, a company was formed near Saltillo, Mexico, for the purpose of building and putting into operation a cotton mill of 10,000 spindles, proposing to manufacture coarse cotton goods for the home market.

The water power which is used for driving the mill was recommended by my brother, Mr. James Prince, who was employed as the engineer. It is 160 feet between the upper and lower levels of water, and the stream is capable of furnishing 600 cubic feet of water per minute.

After selecting this site, it was at first proposed to use as a motor an iron over-shot water wheel of 100 feet diameter, thus losing over one-third of the total fall. But, in consideration of the great cost of such a motor, and the cost of its transportation by land from the Rio Grande to Saltillo, the company deemed it advisable to secure, if possible, some other system of hydraulic machinery.

About this time an estimate was received from Mr. Emile Geyelin, who proposed applying as a motor a double Jonval Turbine, using the whole 160 feet fall, and the full capacity of the stream, (600 cubic feet of water per minute.) The price asked by Mr. Geyelin for the machine was $3300. The small cost—the ease with which the parts could be carried over land, and the opinion of the engineer of its adaptability to the locality, determined the company to accept Mr. Geyelin's proposal.

It has now been in constant use as a motor for over three years, and has, I am happy to say, surpassed our most sanguine expectations. Its full capacity is 126 horse power, all of which power is, however, not yet required by the machinery in the mill.

The following description of its dimensions and manner of construction, I have obtained from Mr. Geyelin:—

High pressure double Jonval Turbine with horizontal shaft, built for a cotton factory, near Saltillo, Mexico, during the summer of 1854. Fall, 160 feet; quantity of water, 600 cubic feet per minute. In order to suit the arrangement of the mill buildings, the turbines are placed 18 feet above the lower level of water, and the water which passes through the wheels, is carried from them to the lower level, through air-tight pipes. An iron conduit pipe, 450 feet long, and 20 inches diameter, serves to lead the water to the wheels. There are two wheels used, which are placed on a horizontal shaft, in order that they may balance each other, thus preventing the enormous thrust on the step, or suspension arrangement, which would have been the case if only one wheel had been used. The shaft is of steel, 2½ inches diameter. The outer ends of the guides, and of the buckets of the turbines, have wrought iron bands shrunk around them, both guide wheels, and tur-

bines proper, being encased in cast iron chambers. Each moving wheel or turbine proper has 15 buckets of polished steel, 2 inches high, and 1½ inches radial length. The total area of orifices of discharge in each wheel, being 13 square inches. The external diameter of the moving wheels is 11 inches. The velocity of the wheels is 1860 revolutions per minute. Capacity of the motor 126 horse power.

Gearing.—Wrought iron pinion on the turbine shaft, 7 inches diameter at the pitch line; 1½ inches pitch; 9 inches face; which runs at a speed of 1860 revolutions per minute. This pinion gears into a mortise wheel on the counter shaft, of 56 inches diameter at the pitch line; 1½ inches pitch and 9 inches face; the cogs are of hickory wood, soaked in warm linseed oil; this wheel runs at a speed of 232 revolutions per minute. The power is transmitted to the line shaft in the mill by a belt 24 inches wide, running over a pulley on the countershaft, of 3 feet diameter.

The pedestals which support the turbine and counter shafts, and also the iron chambers in which the turbines revolve, are all fastened to a strong iron bed-plate, 15 feet long and 4 feet wide.

Hoping the above may prove interesting, and find a place in your *Journal*, I remain, very truly yours,

STEWART PRINCE.

Paterson, New Jersey, April 16, 1858.

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*Consumption of Coals and Rate of Evaporation from Engine Boilers.**

Mr. Graham read a Paper at the Manchester Philosophical Society, in which he described the results of experiments which he had made with a series of small vessels of equal size, the fire being under the first, and the flame bed alone passing under the others. The evaporative power of the first was found to be equal to 100, the second to 27, the third to 13, and the fourth to 8. A second set of experiments with larger vessels, in the shape of boilers, corroborate these results. The third series of experiments were made with the view of determining the value of a supplementary boiler as heating surface, placed under the most favorable circumstances; the result showed an advantage of 15 ℔ cent.

Mr. Graham then detailed the results of a numerous set of experiments on evaporation, on the large scale, with reference to engine boilers. These experiments have extended over a period of several years, observations being made daily, and the results deduced from several hundred recorded observations.

Before beginning to register his results, the boilers were in each case re-set, and, by careful and continuous experiments, were put into what was found to be their best condition for giving the best working result, as regards the admission of air, the draft of the chimney, the size of the fire-place, the distance of the bars from the boiler, the thickness of the fire-bars, and of the fire itself, the form of the

*From the London Mining Journal, No. 1177.

flame bed, flues, and bridges. Mr. Graham stated that in the case of one boiler, the alterations had been repeated at least 30 times for this purpose. The experiments with the boilers were of 12 hours duration each, and number from 30 to 40 for each boiler. A perfect command was maintained of the draft, which varied from 0·5 to 0·7 in. pressure of water, and the temperature of the draft at the bottom of the chimney was generally sufficient to melt lead (612° F.), but never zinc (773° F). The conclusions which Mr. Graham arrived at by means of these experiments were the following:—

1. That the boiler usually called the "Butterley, or Fishmouth boiler," 25 feet long and 7 feet diameter, will, under favorable, but what may be called ordinary circumstances, give with the Worsley coal, for each pound of coal burnt, 8·29 lbs. of steam; or, not including the heating of the feed water from 60° to 212° F., 9·67 lbs.

2. The boiler usually known as James Watt's "wagon-shaped boiler," 25 ft. 6 ins. long, and 6 ft. 6 ins. diameter, will, under similar circumstances, give 8·80 lbs. of steam; or, not including the heating of the feed-water from 60° F. to 212° F., 10·26 lbs. of steam for each pound of coal burnt.

3. The plain cylindrical boiler, with fire-place underneath, 42 feet long and 6 feet diameter, will, under similar circumstances, give 6·20 lbs. of steam; or, not including the heating of the feed-water from 60° F. to 212° F., 7·23 lbs. of steam for each pound of coal burnt.

4. The boiler with two internal fire-places joined into one internal flue, known in the neighborhood of Manchester as the "breeches boiler," 23 ft. long and 8 ft. diameter, will, under similar circumstances, give 5·90 lbs. of steam; or, not including the heating of the feed-water from 60° F. to 212° F., 6·88 lbs. of steam for each pound of coal burnt.

5. That a supplementary boiler, under very favorable circumstances, gives a saving of 15 ℔ cent.

6. That flues round a boiler, when cleaned out, and the sides of the boiler scraped once a week, will give a saving of about 2 ℔ cent.

7. That a difference in the setting alone of the same boiler may produce a difference in the result amounting to 21 ℔ cent.

8. That the difference between a good shaped boiler, properly set, and a bad shaped boiler, improperly set, but both clean and in good order, may amount to as much as 42 ℔ cent.

9. That a difference in firing only will produce a difference in the result of 13 ℔ cent.

10. That the smallest loss by smoke burning, or by the admission of cold air, either over the furnace door or in front of the bridge, or at the back of the bridge, has been 1·7 ℔ cent.

11. That the loss arising from a scale of sulphate of lime, of not more than one-sixteenth of an inch, amounted to 14·7 ℔ cent.

12. That neither wet coal, nor coal which had been out of the pit three years, nor wet weather, nor a variation of temperature in the atmosphere from 40° F. to 70° F., produced any appreciable difference of result.

13. That windy weather invariably gave a good result.

14. That a comparatively thick and hot fire, with a good draft, uniformly gave the best results.

15. That the difference in the results obtained with different coals, all from the immediate neighborhood, amounted to a loss of 11 ℔ ct.

16. That the same coals, reported to be from the same pits, will vary in their results to the extent of 6 ℔ cent.

17. That when a boiler is worked solely for the purpose of heating, by means of its steam, dye vessels, soap cisterns, &c., if its available power, with the steam at a pressure of 2½ lbs., be taken as equal to 100, then at 7 lbs. pressure its available power will be 120, and at 10 lbs. pressure it will be 130; the same quantity of coal being consumed in each case. This surprising result, at present unaccounted for, may be thus stated:—That the same weight of coal consumed in the same number of hours will work ten cisterns at 2½ lbs. pressure, twelve cisterns at 7 lbs. pressure, and thirteen cisterns at 10 lbs. pressure.

18. That while we may reasonably look for improvements in the construction of the fire-place, in the form of boiler, in the addition of separate supplementary heating surface, and in cleanliness, and may thereby effect a great saving in the consumption of coal, we cannot, at the same time, expect much saving from extension of flue space, when coated with soot, or for greater length of boiler than four times the length of the fire-place.

Mr. Graham stated in addition, that in consequence of the uniform low results obtained by evaporation from boilers and flues open to the atmosphere, which, according to his experience, never rise higher than from 5·5 to 6·0 lbs. of steam for each pound of coal burnt, also from the increased results obtained with increase of pressure, and apparently due to that condition, he is disposed to suggest that the rate of evaporation of water per pound of coal increases with, and bears some ratio to, increase of pressure.

With regard to the deposition of sulphate and carbonate of lime and mud in boilers, Mr. Graham stated that he had experimented, with more or less success, with caustic soda, quick-lime, muriatic acid, soap liquor, sawdust, spent madder, and logwood chips. Two facts in particular were noticed as regards the tendency of hard water to "scale"—1. That the sulphate of lime separates from the water when in contact with the bottom of the boiler, or with other substances, such as sawdust or other materials floating in the water; but that no precipitation takes place until the water has been concentrated, by continued evaporation, down to the state of a saturated solution, or to that point which may be termed the "salting point."—2. That *carbonate of lime* and mud are principally liberated in the body of the water, and have but little disposition to adhere to the boiler, unless cemented by the sulphate of lime.

Practically, therefore, it has been found that no scale of any consequence will be produced on engine boilers, even with such hard water and hard firing as Mr. Graham has been accustomed to, if 100 gallons of the concentrated liquor of the boiler, equal to 4 ℔ cent. of the

amount of feed water used daily, and 300 gallons, or 12 ℔ cent., be run away on Saturday through the usual mud machine, and if the boiler be run empty every sixth Saturday and brushed out. The water used was so hard as to require from 35 to 40 measures of Clark's test liquid to soften it. There is little loss incurred by this mode of working, since the chief discharge may take place at the close of each day's work; and there is an incredible advantage gained by the saving of coal, the reduced wear and tear of the boiler, and the greater safety of all persons concerned with it.

Railway Accidents in Great Britain during the Year 1857.*

The Board of Trade Report by Captain Galton, on railway accidents for the year 1857, has just been issued, and from it we learn that in the year 25 passengers were killed, and 631 injured, "from causes beyond their own control."

These are all the real railway accidents in the year. There were others, such as from suicide, trespassing, &c., but they cannot properly be placed against the account of railways.

The 25 fatal railway accidents in 1857, occurred mostly on English railways. Of the 25, as many as 24 occurred in England, and of these 24, exactly half, 12, were killed in one accident, namely, the Lewisham accident on the South Eastern railway. One passenger was killed on Scotch railways. "In Ireland, (reports Captain Galton,) there were no passengers killed or injured from causes beyond their own control." On most of our railways in England no fatal accidents have occurred.

The following is Captain Galton's account of the 25 fatal accidents, specifying the railways on which they occurred:—

In England,—

"One passenger was killed at the London bridge station of the London, Brighton, and South Coast railway, in consequence of a passenger train leaving the rails at some facing points.

"Twelve passengers were killed at the Lewisham station of the South Eastern railway, in consequence of a collision between two passenger trains.

"Five passengers were killed on the Great Northern railway, near Tuxford, in consequence of the train leaving the rails.

"A female passenger who had got upon the step of a carriage in a train which was thrown off the rails near the Collingham station, on the Lincoln Branch of the Midland railway, either fell or jumped off, and was killed.

"One passenger was killed near Hull on the North Eastern railway, in consequence of a collision between a passenger train and a goods train.

"Three passengers were killed on Morgans Moor, near Pyle, on the South Wales railway, in consequence of a collision between two passenger trains proceeding from opposite directions.

"One passenger was killed on the South Devon railway, by his head coming in contact with a bridge."

In Scotland,—

"One passenger was killed near Lossiemouth on the Morashire railway, by falling from a truck which had been imperfectly fitted up to convey excursionists, and the railing of which gave way."

*From Herapath's Journal, No. 982.

Thus, three accidents on three railways supply almost all (20) of the 25 unhappy occurrences—

12 South Eastern railway, Lewisham accident.
5 Great Northern Tuxford accident.
3 South Wales, Pyle accident.

20

The South Eastern have had to pay a pretty penny for the Lewisham accident, for Captain Galton informs us that "the compensation alone in the case of the Lewisham accident on the South Eastern railway amounted to £25,000." £25,000 in compensation for one accident!

The figures following will show how infinitesimally small is the number of fatal accidents to passengers in relation to the number of passengers carried:—

Year.	No. of miles of railway open.	No. of passengers conveyed.	No. of passengers killed.	Proportion of killed to carried.
1850	6326	72,854,422	12	1 in 6,071,202
1851	6755	85,391,095	19	1 in 4,494,268
1852	7113	89,135,729	10	1 in 8,913,572
1853	7488	102,286,660	36	1 in 2,841,296
1854	7842	114,358,888	12	1 in 9,529,907
1855	8175	118,595,134	10	1 in 11,859,513
1856	8499	129,347,592	8	1 in 16,168,449
1857	8900	returns not complete.	25	cannot be calculated.

The proportion of passengers killed to passengers carried will probably be found to be, when the calculation can be made, about one in 5,200,000 in last year; one passenger killed for every 5,200,000 carried.

Bad, therefore, as 1857 has been for accidents, it is better than 1851 and 1853. We have seen how it is that the number killed is so high as 25 persons. We might say that one casualty causes the excess.

Nearly all the accidents occurred "from accidents which happened to trains."

The suggestion of Captain Galton contained in the paragraphs we now quote, is worthy of consideration—

"Having regard to all the circumstances of this intricate question, it appears that the only practicable mode of obtaining a diminution of railway accidents would be to endeavor, by means of a more satisfactory investigation into the causes of the accidents, to obtain a more sure and just action of the law by which compensation is awarded. This would, probably, be best effected by causing a public inquiry to be made into the circumstances connected with every accident attended with injury to passengers or loss of life, and by an immediate publication of the report, showing the causes of accident. The necessary tribunal might be constituted in a similar manner to those which inquire into accidents to ships under the Merchant's Shipping Act, viz: by two justices or a stipendiary magistrate, and an inspecting officer of this department as assessor.

"The clear knowledge of the cause of accidents would save much useless litigation by claimants for compensation; and the shareholders and the public would obtain an impartial account of the circumstances which led to the accidents, immediately after their occurrence, which would tend materially to diminish mismanagement."

Remarks by the Editor of Herapath's Journal on Ellwood Morris' Fish Splice for Railway Joints.—April 10th, 1858, No. 983.

We offer no objection to this modification of the usual mode of fish jointing; but it appears to us, if it be found in practice to have any advantage, it will lie chiefly in the length of the chair; and any defect will probably be found to lie in the possible want of a close fit of the foot of the rail to the bottom of the chair, through, in part, the thrusting upwards of the rails by the method of keying the chair to them.

On a new Water Connexion between Locomotive Engines and Tenders. By Mr. James Fenton.

Since the first introduction of the locomotive engine, now more than a quarter of a century ago, several plans have been adopted for connecting the feed-pipes of the engine and tender, capable of resisting for a time, without leakage, the great wear that takes place in the ordinary course of running, which is accelerated by blowing steam from the boiler of the engine into the tender tank. All these plans however have been expensive either in first cost, or to keep in repair, or both. Those most generally in use are the ball and socket pipes, and the flexible tubes or hose-pipes. Other and more recent inventions have been tried, but the author believes they have not been attended with an amount of success sufficient to ensure their general adoption.

With the view of meeting an acknowledged want, the author's attention was directed to the subject, and the water connexion described in the present paper is the result.

Two cylinders of brass or iron, bored out smooth and parallel, are bolted in the usual manner, the one to the feed-pipe of the engine, and the other to that of the tender. These cylinders are connected together by a tube of brass or iron, having the ends turned, and fitted with two collars, between which elastic rings of vulcanized india-rubber are placed. These rings, when at work, roll between the cylinders and the connecting tube. Light chains passing from the cylinders to the connecting tube, are used for keeping the tube in its proper position; they are each left slack to an extent of one-half the greatest amount of travel required between the engine and tender.

The advantages which this arrangement appears to possess are its extreme simplicity, and consequent cheapness, both in first cost and current repair, and the great durability of the only wearing parts; the motion of the elastic rings, when at work, being a rolling instead of a rubbing action.

The india rubber rings are made slightly larger than the space into which they fit, for the purpose of ensuring a thoroughly water-tight joint. The cylinders are $3\frac{1}{16}$ inches inside diameter, and the tube 2 inches outside diameter: the ring is made $3\frac{1}{8}$ inches outside diameter, and $1\frac{7}{8}$ inches inside diameter,—the section of the ring being a circle $\frac{5}{8}$-inch diameter.

Should either of the tender valves get out of order on the journey, and it becomes necessary to stop the feed by other means, it is only requisite to slack back the bolts of the coupling flanches, and introduce a piece of sheet iron or zinc between them, of sufficient width to cover the orifice of the feed pipe. This simple and effectual mode of stopping the feed was suggested and adopted by Mr. Ramsbottom, of the London and North Western Railway, on which, as well as on several other lines of railway, this water connexion has been in successful operation for several months.

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Mr. FENTON showed a specimen of the new coupling pipe, partly cut open, in order to show the action of the india rubber rings; also separate specimens of the rings.

Mr. RAMSBOTTOM said he had had one of these coupling pipes in use rather more than two months on a locomotive, and it had worked so far very satisfactorily; the india rubber rings showed no signs of wearing out at present. He thought it decidedly a good plan, and likely to prove advantageous in use.

Mr. CRAIG had had one of them at work about three months, applied to a stationary force pump, working under 300 lbs. per inch pressure, and it had proved quite successful. He had now applied them to several locomotives, and was well satisfied with the results; he considered they would be much less expense to keep in order than either the hose pipes or the ball and socket couplings, and the economy of first cost was also in their favor.

Mr. W. B. JOHNSON had found india rubber valves last many years in steam engine air pumps, where they were exposed to a considerable temperature, sometimes 150°, but the material was subjected only to simple bending.

In answer to an inquiry of the Chairman, Mr. Fenton said, the cost of the coupling was £2 per set as compared with about £12 12*s.* for the brass ball and socket couplings,—being only about one-sixth in first cost; and there was also a considerable saving in the cost of maintenance. The rolling action to which the packing rings were subjected did not appear to be injurious to their material, as they had already run upwards of 8000 miles without any sign of injury, although exposed to the heat of blowing steam into the tender in the ordinary manner.

Proc. Insti. Mech. Engineers, London.

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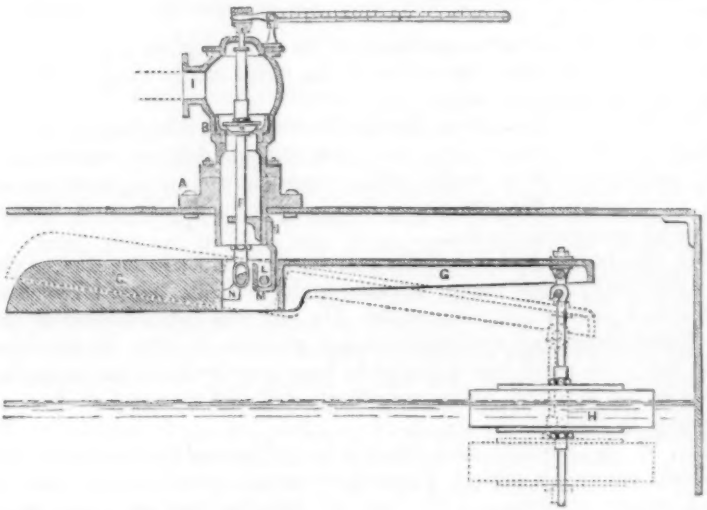
*Description of a Valve Guard against Excess of Steam Pressure and Deficiency of Water.** By JAMES CLARKSON KAY.

[Extracted from a Paper read at the Institution of Mechanical Engineers, Birmingham.]

A is a pipe fixed to the boiler, upon which the valve case B is placed. In the valve case B, is the valve seating C, constructed in the form of a cup, at the bottom of which the valve D is seated; the seating portion of the valve is of a spherical form, and above the valve and form-

*From the Lond. Civ. Eng. and Arch. Journ., April, 1858.

ing part of it, is placed a disk E, of larger diameter than the valve. The valve is placed on a spindle F, to which is attached a weight G, which loads the valve. The weight G may be made in any form convenient when acting simply for a steam pressure safety valve; but in this case, when the valve is intended to act also as a low water safety valve, the weight is made in the form of a lever, at the end of which is placed a stone float H, the combined weight of the lever, float, rods, &c., less by the weight of water displaced, being the load of the valve.



When the steam-pressure in the boiler acting on the underside of the valve D exceeds the load, the valve is raised; and the steam then acting on the enlarged area of the disk E, and being partially confined by the cup C, the valve continues to rise until a discharge of steam takes place through the pipe I, equal to the area of the pipe or valve seating.

In the case of low water in the boiler, the float sinks as the water lowers; and the increased weight at the end of the lever G brings the brass centre pin L to rest on the fulcrum or stirrup M, and raising the pin N, in the loop of the valve rod, unloads the valve, leaving it free to the action of the steam; the discharge of steam then takes place irrespective of the pressure of steam at the time or the size of the valve.

On an Improved Construction of Upright Steam Boilers.

By Mr. Thomas Dunn.

The early forms of upright boilers, with chimney placed through the crown of the boiler, or in the side near the top, allowed a great portion of the heat to pass into the chimney flues. An attempt was made some years ago to retain this heat, by placing tubes of small diameter in the

crown of those boilers; this, however, rendered it liable for dirt and sediment to collect on the top of the tube plates next the fire, causing them to burn away, as also the ends of the tubes.

These objections led the writer to contrive a boiler which should retain the heat without the use of tubes, and should also cause a mixture of the gases for the purpose of burning the smoke.

This improved upright boiler has two furnaces, the heat and gases from each rising into the crown of the boiler, in which they meet and combine; the alternate working of the fires causing the flame from one fire to burn the smoke formed in the other, and *vice versâ;* the heated current then turns down through a central space, passing again through the water before entering into the chimney flue. Several of these boilers have been made and tested, and have worked very satisfactorily. One, which has been at work nine months at the writer's works, is of the following dimensions:—diameter of outer shell, 4 feet 6 inches; height from ground line to top of crown, 10 feet; diameter of inner fire-box, 3 feet 11 inches; width of down draft flue, 5 inches. The whole of the fire-box and boiler is of Staffordshire iron, the outer shell being $\frac{3}{8}$-inch thick, and the inner fire-box and flue $\frac{7}{16}$-inch thick. The heating surface measures 145 square feet, and the fire-grate is $7\frac{3}{4}$ sq. feet area. The flat water spaces, forming the down draft, are 3 inches wide, and stayed with screw stays 5 inches apart, similarly to a locomotive fire-box.

The following general results were obtained in a set of experiments made with this boiler, taking the mean of three days' working with each description of coal; the steam pressure being maintained at 65 lbs. per square inch throughout, and the temperature of the feed water at 62° F.:—5·90 lbs. of water were evaporated per lb. of coal, with best Lancashire coal, at 10*s.* per ton delivered, burning 16·48 lbs. per square foot of grate per hour; 4·38 lbs. of water were evaporated per lb. of coal with Burgy or the refuse of coal pits, at 5*s.* 6*d.* per ton delivered, burning 20·90 lbs. per square foot of grate per hour. The outer shell of the boiler was not clothed, which caused a considerable loss of heat by radiation in the experiments.

After trying several of these boilers, the writer constructed one with a circular down draft flue, for the purpose of saving the expense of stays: this plan did not give quite so much heating surface, but allowed rather more grate area; and the results of this boiler were found very similar to those of the former experiments. The fire in this boiler is not divided, but the gases are allowed to combine in the fire-box.

This plan of boiler is well adapted for the interior of buildings, where dust and dirt from ordinary boilers would be an annoyance, as the ash-pits are below the surface of the floor, and are made to hold the accumulation of a week's ashes. No external iron chimneys or pipes being required, there is also less risk of accident by fire. The expense is not more than that of the ordinary upright boilers. These boilers have been proved with water pressure to 150 lbs. per square inch.

Proc. Insti. Mech. Engineers, London.

AMERICAN PATENTS.

List of American Patents which issued from March 30 to April 27, 1858, (inclusive,) with Exemplifications.

MARCH 30.

268. Cultivators; Joseph Banks, Dadeville, Alabama.

Claim—The construction, arrangement, and combination of the body of the implement and its movable teeth, whereby it is readily adapted to properly receive, in turn, the several scrapers employed for performing the various modes of cultivation.

269. Sugar Mould Carriages; Charles E. Bertrand, Williamsburgh, New York.

Claim—The sugar mould carriage, constructed and arranged to operate as described—that is to say, the platform, in combination with stationary pins, supported by two wheels and a caster, the standard of which bears against, and pivots in the upper or brace plate, the latter being composed of semicircular arms, holding, in connexion with guard chains or bars, the conical moulds.

270. Regulator for Time Keepers; Dana Bickford, Westerly, Rhode Island.

Claim—Fitting the compensating curb to a curved groove, or its equivalent, furnished with a number of set screws which operate to secure the curb in its place, and to adjust or vary the effective length thereof, and thus constitute a means of correcting its compensation.

271. Machines for Hulling and Cleaning Clover Seed; I. V. Blackwell, Ovid, New York.

Claim—The application of the gravitating curtain at the point of the eduction of the blast, for the purpose of modifying and diffusing the same, and preventing the waste of seed. Also, the combination and arrangement of the overshot grating cylinder and feed roller, the blast generator, and blast regulating curtain.

272. Cigars; Thomas Blanchard, Boston, Massachusetts.

My invention consists in making the cigaretta with a hollow tube through its centre, the tube being formed out of the wrapper itself.

Claim—As a new article of manufacture the cigaretta or paper cigar.

273. Staples for Blind Slats; Byron Boardman, Norwich, Connecticut.

Claim—Constructing wire staples (such as are used for connecting the semi-revolving slats of window blinds and screens to a rod governing their positions,) by giving them a rounded edge, and an acute or sharp edge as viewed crosswise, in combination with transverse indentations across the wire, the whole being formed by compression between dies.

274. Paper Files; W. Z. W. Chapman, City of New York.

Claim—The combination and arrangement of two or more wires, or their equivalent, on a rod, or its equivalent. Also, the combination of the ring or rings, and lock plate, for securing the ends of the wires.

275. Harvesters; George E. Chenoweth, Baltimore, Maryland.

Claim—Compensating for the wear of the worm or groove in the driving cylinder by making the parts of that cylinder adjustable, thus giving increased certainty to the action of the cutters.

276. Lubricators for Railroad Axles; Wm. Clough, Madison, Indiana.

Claim—The combination of the oiling finger sleeve or hub, slotted arm, and wrist. Also, making the oiling finger sleeve and slotted arm, from the same piece of wire.

277. Opening and Closing Outside Blinds; John E. Clokey, Washington, D. C.

Claim—The combination of the bent levers with the bars.

278. Screw Cutting Machine; Richard H. Cole, St. Louis, Missouri.

Claim—Arranging a set of vibrating chasers in a revolving chuck, in such a manner that the said chasers may be opened and shut while the chuck is in motion, and of so constructing and adjusting the said chasers that they shall turn the bolt blank to a given size, and chase the thread on it in one and the same operation. Also, the combination of the two plates and the cam with the cross-head. Also, combining the turning lathe with the screw cutting machine, whereby the heads of the bolts are turned at the same time the chasers cut the thread on their points. Also, combining a universal chuck in the opposite end of the same shaft on which the chasing chuck is fixed, whereby the nut can be tapped at the same time the thread is cut on the bolt, and with the same power and motion.

279. Horse Hay Rakes; Asahel Cowley, Harpersfield, New York.

Claim—The combination of a separator with a wheel rake.

280. Manufacture of Soap; Dalrymple Crawford, Toronto, Canada.

Claim—Mixing with soap the refuse from indian corn after it has been subjected to the action of alkali in extracting the starch.

281. Folding Billiard Table; Charles Croley, Cincinnati, Ohio.

Claim—The arrangement of certain devices for folding and moving the frame of the table, and swinging the bed of the table, consisting of the pieces, hinges, the levers, leg pieces, and rollers, and the links and rollers.

282. Compositions for Tanning Leather; Clinton Daniels, Elk Horn, Wisconsin.

Claim—The combination and use of cream of tartar and bi-carbonate of soda with catechu in making a liquor, and using the same for tanning hides and skins.

283. Balance Steam Trap; Wm. M. Davis, Philadelphia, Pennsylvania.

Claim—The construction of a balanced lever through which a passage to discharge the excess of condensation is opened by the weight of such excess.

284. Printing Presses; G. W. Davis, Seneca Falls, New York.

Claim—The arrangement of the double-armed lever, plate, bed, and the adjustable upright frisket.

285. PREVENTING CORROSION OF THE BINDING SCREWS IN GALVANIC BATTERIES; George Doyle, Ottawa, Illinois.

Claim—Making the connexions of the battery by fitting the jars with covers of glass, glazed or enameled earthenware, gutta-percha, or other insulating substance, with holes in them to receive the shanks of the binding screw sockets, and screwing the said sockets through the said holes into the clamps for the plates, with interposed washers of india rubber, leather, or similar protecting material.

286. ROTARY RECIPROCATING KNIVES FOR SMOOTHING STAVES; Wm B. Dunning, Geneva, New York.

Claim—The arrangement and employment of the oscillating cutting tools for smoothing the stave, &c.

287. SELF-LOOSENING HORSE AND CATTLE TIE; John J. Eshleman, Lancaster, Pennsylvania.

Claim—The bolt in two sections, connected by the sliding scarf-joint, for the purpose of instantly loosening the horse. Also, the devices of the bolt, spiral spring, and casing, all in combination.

288. AXLE BOXES; Wm. B. Fahnestock, Lancaster, Pennsylvania.

Claim—The combination of the axle and boxes, for the purpose of allowing the axle to turn and accommodate the wheel to the direction of the rail.

289. CAR WHEELS; Wm. B. Fahnestock, Lancaster, Pennsylvania.

Claim—The wheel with the hub outside of the tread or rim, and the bearing on the axle within the tread or rim, or at the balancing point. Also, the combination of the independent wheel, bearing, and pivot, with the short axle, for the purpose of preventing the sliding and friction of the wheels on or against the rail.

290. PNEUMATIC SPRINGS; Wm. R. Fee, Cincinnati, Ohio.

Claim—The pneumatic spring having a hollow metallic piston working closely in a hollow metallic cylinder, and packed by leather and oil, for the purpose of increasing the elasticity of the spring and preventing explosions and leakage.

291. CANE FOR PAYING OMNIBUS FARES; Samuel W. Francis, City of New York.

Claim—Inserting pieces of money in a cane for the purpose of handing omnibus fares.

292. LIGHTING GAS BY ELECTRICITY; Samuel Gardiner, Jr., City of New York.

Claim—Placing a coil of platinum wire, or its equivalent, in the relative position of the jet of gas, for the purpose of lighting the jet by electricity, and for re-igniting it when blown out.

293. TESTING AND MEASURING THE STRENGTH OF CAR SPRINGS; Perry G. Gardiner, City of New York.

Claim—The combination and arrangement of the plunger with the adjustable spindle, and adjustable knife edge pivot, and the guide plate, arranged and operating in connexion with balance beam, so as to test the power of the spring, and at the same time measure with great facility and rapidity the exact weight or pressure to which the spring has been subjected, the whole being adjustable to any required size or power of spring.

294. MACHINES FOR SLATING COAL; T. Garretson, Pottsville, Pennsylvania.

Claim—The construction of the sides of the screen and the openings, to bring the said openings outside of the guard bars, and give to the said openings a tangential direction, and to form tangential, or nearly tangential, conductors leading to the said openings.

295. HORSE POWER MACHINES; James Grant, Rochester, New York.

Claim—Making iron horse powers with an open centre to the caps, and an adjustable or a fixed bridge piece, and making a double length or reversible pinion.

296. CONSTRUCTING DOLLS' HEADS; Ludwig Greiner, Philadelphia, Pennsylvania.

Claim—Strengthening the seams and projecting or exposed parts of dolls' heads, by cementing or pasting on those parts muslin, linen, silk, or other equivalent material.

297. APPARATUS FOR MANUFACTURING WHITE LEAD; Henry Hannen, Dubuque, Iowa.

Claim—The pipe with its branch pipes and stop-cocks, the pipes and the diffusing pipes, and their respective stop-cocks, in combination with the valves or stoppers, the whole being arranged and operated for the purpose of exposing the metal to the action of the different agents employed alternately and successively.

298. CLOTHES' DRYER; James J. Hamilton, New Castle, Indiana.

Claim—The application of the roller and pulleys to the arms, and the folding of the arms to the post.

299. SELF-WAITING TABLE; George W. Hagey, Smithland, Kentucky.

Claim—The handle for the purpose of turning the table, and to which a table cloth may be buttoned.

300. SAWING MILL; Wm. Hawkins and Wm. C. Clary, Milwaukie, Wisconsin.

Claim—The manner of automatically changing the saws after each cut, alternately from an oblique position in one direction to an oblique position in a contrary direction, to the line of the log carriage, by means of the studs, slide, double lever, connecting rods, in combination with the frame and the guides. Also, the use of the two wedge rollers or wedges to keep the board clear of the saw while cutting in either direction. Also, the combination of pinions and their pins entering into recesses of plates, the ratchet wheels, the adjustable segments, the wheels, the screws, and the rods, with their clutches, for the purpose of automatically setting the log to the saw, and stopping the setting when the log frame advances too close to the saw. Also, the notched plate, in combination with the latch, lever, and link, for the purpose of operating the bolt shifter without turning the lever.

301. HEATING APPARATUS; Francis L. Hedenberg, City of New York.

Claim—The arrangement within the case of the fire-box, spark or draft chamber, and the flue and air-pipes, the whole being surrounded by water space.

302. RAILROAD CAR WHEELS; Wm. W. Hubbell, Philadelphia, Pennsylvania, and Richard H. Hubbell, Delaware Co., Pennsylvania.

Claim—The circular vertical flanches of the rim and plate, cast separately, turned off smooth, and fitted together. Also, the central plate strengthened with ribs and made thicker around its outer edge where it is secured to the rim, in combination with the vertical flanches on the rim and plate.

303. GAS GENERATORS; John G. Hock, Newark, New Jersey.

Claim—The arrangement together of the rain retort, chambers, and open space.

304 COMPOSITION FOR COATING TELEGRAPH WIRES; J. B. Hyde, City of New York.

Claim—An insulating compound for telegraphic wires, formed by mixing boiled linseed, cotton seed, or rosin oil with good natural or artificial asphaltum.

305. Straw Cutters; W. W. Hallman, Eddyville, Kentucky.

Claim—The combination of the movable bottom with the cam shaft, cams, and connecting rod, for giving a projection of straw under the knife by raising the lever, said projection being gauged and furnished by the upward and downward motion of the lever.

306. Coffee and Tea Pots; James M. Ingraham, City of New York

Claim—The steam tight coffee pot, the filterer, with the conical chamber and the siphon combined.

307. Air Heating Furnaces; T. D. Ingersoll, Monroe, Michigan.

Claim—Constructing the radiator and arranging the dampers within it, so that the dampers may perform the double function of dampers and scrapers.

308. Churn; John A. Jordan, Shelbyville, Tennessee.

Claim—The employment of the revolving wheel and stationary wheel, constructed and operating in the churn, the bottom of the same being fitted in a stove casing.

309. Combination of Lead Pencil and Eraser; H. L. Lipman, Philadelphia, Pennsylvania.

Claim—The combination of the lead and india rubber, or other erasing substance, in the holder of a drawing pencil.

310. Scissors' Sharpener; J. C. Loveland, Springfield, Vermont.

Claim—As a new article of manufacture, the instrument for sharpening scissors, consisting essentially of the revolving file and guide.

311. Diving Bells; Benjamin Maillefert, Astoria, New York.

Claim—The combination of the reservoir with the bell and tube.

312. Lathe Chuck; John L. Mason, City of New York.

Claim—The chuck for spinning screw caps, having a flanch, a rounded thread, and a rounded groove, and the thread vanishing gradually at the flanch.

313. Windlasses; Joseph P. Manton, Providence, Rhode Island.

Claim—The arrangement of the pawls, wheel, hub, ratchets, and gearing.

314. Washing Machine; James McVicker, Green Co., Pennsylvania.

Claim—Forming a receptacle within the wash-box for containing the clothes to be steamed, preparatory to their being washed, by means of the ribs or slats attached to the wash-box, and the ribs or slats attached to the lid, so that upon opening the lid of the wash-box the receptacle is also opened for the introduction or removal of the clothes.

315. Ticket-holders for Railroad Cars; M. L. Mickles and L. S. Olmstead, Aurora, Illinois.

Claim—A ticket-holder composed of two chambers or compartments, into the upper one of which the ticket is placed and exhibited, and thence transferred to the lower one in the act of closing and opening the door of said upper compartment, by means of the movable floor and ledge or projection.

316. Wrench; Archibald Murray, Troy, New York.

Claim—My improved adjustable wrench, in which the movable jaw is fastened to the fixed one, by means of a ring or collar which surrounds and slides upon the shanks of both jaws together.

317. Desk Seats for Schools; Charles Perley, City of New York.

Claim—Supporting the seat by a bracket extending from the pedestal or column of the desk, whether said seat be a permanent fixture or fitted to swing around, whereby the floor is unobstructed by the separate legs or pedestal of the seat, and greater facility afforded for clearing the room and more space given for the feet of the scholars.

318. Brick Machine; J. L. Ransom, Charleston, South Carolina.

Claim—The box provided with the follower, in combination with the roller frame, feeding bar, and scraper. Also, the adjustable roller, arranged as shown, and operated by means of the cams on shaft.

319. Sewing Machines; O. L. Reynolds, Dover, New Hampshire.

Claim—The loop distender, operated by, and operating in combination with, the shouldered looper.

320. Railroad Car Couplings; John W. Rice, Springfield, Massachusetts.

Claim—The fulcrum-drop and notches on the under side of the hook link and the rod, when used in combination with each other.

321. Railroad Brakes; John C. F. Salomon, Baltimore, Maryland.

Claim—1st, The employment of small auxiliary wheels between the main wheels of the locomotive and several cars of the train, said wheels being adjustable up and down. 2d, The combination with the said auxiliary suspending and compensating wheels of a brake.

322. Stoves; Silas T. Savage, Albany, New York.

Claim—In furnaces or stoves the employment of a receptacle for the fuel, closed at front and partially at bottom, with open grate bars for a part of its bottom and for the rear, opening into an air or draft chamber between them and the back plate of the fire chamber.

323. Casting Types for Printing; George Schaub, Hamburgh.

Claim—Manufacturing types for printing by casting the stems or bodies of the types at the back of a sheet of type heads, and finishing the same; also, the manufacture of spaces used in setting up printing types by the use of the movable frame.

324. Applying Pendulum Power; Andrew Slevin, Ann Arbor, Michigan.

Claim—The peculiar combination of the pendulum, bevel wheels, pawls, and ratchets, for the purpose of obtaining a rotary motion from the reciprocating motion of the pendulum.

325. Manufacture of Tubular Wrought Iron Shafts; W. A. Stephens and Richard Jenkins, Covington, Ky.

Claim—The manufacture of wrought iron bars for tubular axles, shafting, or other purposes, by rolling from a solid pile in a system of grooves, by which the pile is first flattened, then grooved longitudinally, and afterwards has the sides of its groove closed together and welded.

326. Machine for Shelling Peas; William J. Stevenson, City of New York.

Claim—The combination of the rollers and endless cords.

327. Cross-cut Sawing Machine; George Telford, Pike, New York.

Claim—The bar with the saw attached, the arm, connecting rod, and wheel, when arranged relatively. Also, the bar and saw, in combination with the log carriage and cylinder, grooved and armed with spikes.

328. MASTIC COMPOSITION; Joseph Thompson, North Wrentham, Massachusetts.

Claim—The right of using the naturally finely divided remains of silicious rocks which have an alkaline action on test paper, as fullers' earth, instead of sand, gravel, or other solid material.

329. HARVESTERS; Wm. Van Anden, Poughkeepsie, New York.

Claim—The use of a rectilinear spring, in combination with the detent cam, having guides on the face thereof, for the purpose of actuating the cutter of a harvester machine endwise in opposite directions from a state of rest, by the impulsive stroke of the spring, which said spring is charged by its opposite curvatures, while the cutter remains at rest. Also, the employment and use of the cam wheel, having on its face guides, in combination with a crank shaft, for the purpose of giving two vibrations to the cutter to one revolution of the cam wheel. Also, the combination of the spring (or springs as may be used,) with the cam wheel, crank shaft, and vibrating lever, attached to the cutters, for the purpose of operating the same.

330. TEMPERING AND HARDENING STEEL AND IRON; Horace Vaughan, Providence, Rhode Island; patented in England, December 29, 1856.

Claim—The use of a bath of chloride of sodium with or without ferro-cyanide or bi-chromate of potash or either of them, or of other ingredients possessing similar chemical properties, combined with animal vegetable charcoal and ground bone, when the foregoing substances are in a state of igneous fusion.

331. WOOD SCREWS; James M. Whiting, New Bedford, Massachusetts, and Geo. F. Wilson, Providence, R. I.

Claim—The making of wood screws with the upper side of the thread of greater depth than the under side of the thread

332. ROTARY CUTTER FOR TONGUING AND GROOVING; James A. Woodbury, Winchester, Massachusetts.

Claim—The combination of the chisel cutter or cutters with the lip cutter or cutters.

333. MILLS; Joel Woodward, Philadelphia, Pennsylvania.

Claim—1st, The mode of the bush on the plate running up inside of the balance ryne. 2d, The mode of the lower stone working on a loose or balance ryne, that has a nut or breaker resting on, or fastened to, the top of it, and may work with or without a balance or upper bearing 3d, The manner of the inside pot or teeth made to raise and lower, to open and close the aperture, by means of the lever (or screw) to regulate the feed of the stones and grinding of the crusher or breaker.

334 SEED DRILLS; George S. Ball, Assignor to Benjamin Kuhns, Dayton, Ohio.

Claim—The slide with the attachment of the clips in combination with the slides.

335. CORN SHELLERS; Peter Bergen, Assignor to Jane Ann Bergen, City of New York.

Claim—The combination of the delivery flap C1 bottom of the hopper, the piece, the pins on the shelling cylinder, the cradle and the springs.

336. RAILROAD CAR WHEELS; Henry C. Bulkley, Assignor to James M. Ross, Springfield, Massachusetts.

Claim—1st, My mode of constructing the hub, viz: by reducing the iron around the outer periphery of the hub and to give the requisite strength, I substitute a flanch or ring on the end of the hub, when used in combination with a railroad car wheel with one or more plates. 2d, Increasing the thickness of the disk as it recedes from the hub to the thread of the wheel.

337. PRESSES; Simon Ingersoll, Assignor to self, S. B. Turner, and George W. Kimball, Brooklyn, N. York.

Claim—The levers, chain I, shieve J, when arranged on the beams.

338. MANUFACTURE OF HOES; Judson Knight, Newark, N. Jersey, Assignor to R. W. Booth, Providence, R. I.

Claim—The welding of a wrought iron plate between the steel blade and the malleable cast iron eye, or in other words, I claim the hoe constructed of the three pieces, arranged relatively to each other and welded together.

339. STEERING APPARATUS; Isaac Moore, Assignor to self and Francis N. Grove, Brooklyn, New York.

Claim—The manner of relieving the rudder stock of any sudden strain or concussion by the endwise motion allowed to the screws, in combination with the springs, or equivalent yielding pressure.

340. HAND EXERCISER FOR MUSICIANS; Jules Monestier, St. Denis, near Paris, France, Assignor to R. F. Spangenberg, Brooklyn, New York.

Claim—Giving agility and suppleness to the fingers, hand, and wrist of musicians, by the exercise induced by the application of my "agili main."

This invention consists in applying weights to the wrist or fingers, or both.

341. PERMUTATION LOCK; John H. Morse, Assignor to self and Lester Patee, Peoria, Illinois.

Claim—The "blind" or shallow slots, or their equivalents, in the circular plates, made and arranged so as to receive the points of projections on the bar.

342. MACHINES FOR BURRING WOOL; T. Musgrave, Leeds, Assignor to Anna Musgrave, Northampton, Mass.

Claim—The combination of the second burring cylinders and its beaters with the first burring cylinder with its beaters, by means of an interposed stripper, or an equivalent therefor.

343. ATTACHING THE PLUMB LINE TO A PLUMB AND LEVEL INDICATOR; John L. Rowe, Assignor to Frederick Stevens, City of New York.

Claim—The attachment to a plumb and level indicator of the reel and cord.

344. SEED PLANTERS; Samuel Thompson, Assignor to self and A. W. Taggart, Hopedale, Ohio.

Claim—The cutter attached to the wheel of the framing, in combination with the seed distributing slides, operated by the cams attached to the cutter wheels.

345. LIGHTNING CONDUCTORS; Oren White, Assignor to Henry C. Janes, Racine, Wisconsin.

Claim—1st, The lightning conductor consisting of iron wires enwrapped by sheet copper, for the purpose of increasing the strength and the conducting power of the rod without materially lessening its flexibility or greatly increasing the expense of manufacture. 2d, The sheet metal joint or clutch for connecting additional rods or points to the main rod.

346. HUBS OF CARRIAGE WHEELS; James M. Whiting, New Bedford, Mass., Assignor to self, Geo. F. Wilson, and Alfred Anthony, Providence Co., Rhode Island.

Claim—The making of the hub an elastic compound cylindrico-lever, each end of which rests for a fulcrum on vulcanized india rubber or gutta-percha, or other elastic substance, in combination with the coupling

nut, by which the pressure thereon may be regulated. Also, the grooves in the body of the hub, or their equivalents, and the projections on the outside of the box, or their equivalents, in combination with the said elastic substance.

347. COTTON PRESSES; Henry Shrader, Burnsville, Alabama.

Claim—The construction and combination of the double racks with the toggle joints. Also, the hinge connecting the lower ends of the toggle levers with the follower, in combination with the operation of the levers, by which both followers are operated at the same time and with the same application of power.

ADDITIONAL IMPROVEMENTS.

1. STEAM PLOUGHS; Pierre Klingle, Washington City, D. C.; patented February 23, 1858; additional dated March 9, 1858.

Claim—The placing of clearers in connexion with the off bearing wheel of my steam plough, in such a manner that the one will fill back the furrow that the other has opened.

2. CUTTING FLOUR MILLS; Jonathan Burdge, Cincinnati, Ohio; patented June 10, 1856; additional dated March 9, 1858.

Claim—The doubly conical concavity in, and cutting ridges on, the face of the cutter head, arranged and acting in combination with the concavity and ridges of the counter plate. Also, extending the ridges inward beneath the feeding aperture of the counter plate, in combination with the inner conical concavity of the cutter head, and with the counter plate.

3. CLASPS FOR METALLIC HOOPS; James R. Speer, Pittsburgh, Pennsylvania; patented Dec. 1, 1857; additional dated March 23, 1858.

Claim—Bending the ends of the clasp across the apertures, so as to present an opening in the clasp for the insertion of the bent ends of the bands at right angles, or nearly so, to the direction in which the bands are inserted in the clasp.

4. HANGING CARRIAGE BODIES; J. M. Jones, Palmyra, New York; patented July 22, 1857; additional dated March 30, 1858.

Claim—The combination and arrangement of the disk or fifth wheel, attached to the front axle, the embracing circularly flanched annular disk, with its laterally projecting arms or trunnions, to which are attached the bars or spring levers, so as to preserve the horizontal position of the fifth wheel while allowing the necessary play of the said bars.

5. AUTOMATIC RAILROAD CAR BRAKE; W. R. Jackson, Baltimore, Maryland; patented September 8, 1857; additional dated March 30, 1858.

Claim—The arrangement of parts, or its equivalent, for the simultaneous compression of the forward and rear springs, and the consequent operation of the brakes, the same consisting in the combination of the lever with the slide bar and pushing rods.

EXTENSION.

1. SUSPENDING, OPENING, AND CLOSING LOCK GATES; Henry McCarty, Pittsburgh, Penna.; patented March 16, 1844; extended March 16, 1858.

Claim—The mode of suspending, and opening, and closing gates for locks, and other places, by means of the combination and arrangement of the inclined post, rod, swivel, stirrup, and hog chains, and the triangular hinged lever, segment way, cord, pulleys, and windlass, by which the expense of construction is reduced, and the old railway and rollers at the bottom of the lock, and the chains for opening and closing the gates placed in the water, where they are subject to constant oxidation and breaking, and where they cannot be reached without much difficulty when out of order, are entirely dispensed with.

RE-ISSUES.

1. MACHINE FOR MAKING BARRELS AND OTHER CASKS; Isaac Crossett, Bennington, Vermont; patented July 1, 1844; re-issued March 2, 1858.

Claim—The vibratory block or bed, adjustable gauge, and knife or cutter, arranged relatively with each other so as to operate.

2. RUNNING GEAR FOR LOCOMOTIVE ENGINES; Septimus Norris, Philadelphia, Penna.; patented Sept. 28, 1854; re-issued March 2, 1858.

Claim—So arranging the running gear of a locomotive engine, as to make the driver support its outer weight, in combination with a pilot truck vibrating freely to guide the engine.

3. LIFE-PRESERVING RAFTS; Lorenzo Taggart, Philadelphia, Pennsylvania; patented Jan. 26, 1858; re-issued March 2, 1858.

Claim—A life-preserving raft formed by the ordinary water casks or tanks of ships, having eyes secured thereto so as to be air-tight, and connected by spring stay-rods, in combination with a rope net work and canvas sheet.

4. GAS TUBE JOINT; Charles Monson, New Haven, Connecticut; patented January 19, 1858; re-issued March 9, 1858.

Claim—A conduit universal joint made with the armed branches, G H, and their connexion, cross-jointed together, and provided with one or more passages, so arranged in them as to open a communication from one leading tube, A, to the other, B, with which such conduit joint may be connected. Also, the combination of the relief ring, C, or its equivalent, with the armed branches and the connexion cross, the same being arranged therewith.

5. LARD LAMPS; Isaac A. Coffin, Washington City, D. C.; patented March 17, 1857; re-issued March 16, 1858.

Claim—The combination of the hot air chamber which is formed by the arrangement of flat inclined wick tubes. Also, the combination of the flat inclined wick tubes with the concave reflector; my invention having special reference to a lard lamp.

6. MACHINE FOR MAKING HAT BODIES; Wm. Fasket, Meriden, Connecticut; patented Jan. 23, 1846; re-issued March 23, 1858.

Claim—The automatic method of forming hat bodies, having the required variation in thickness at their

different parts, by supplying picked fibres to an exhausted former of the size and shape required, in such manner that a larger portion of picked fibres is supplied to that part of the former which corresponds with the thickest portion of the hat body, and a less portion to the other parts of the former. Also, the combination of a picking apparatus, a hat body former, an air exhausting apparatus, and a conductor. Also, a bow string picking apparatus, constructed and operating to pick fur presented to it by a suitable feeding and nipping apparatus.

7. Employing Centrifugal Force in Casting Iron Pipes; Thomas J. Lovegrove, Baltimore, Maryland; patented Dec. 26, 1848; re-issued March 23, 1858.

Claim—Forming pipes or other castings by centrifugal force, by causing the mould into which the liquid material is poured to revolve.

8. Grain Separators; John R. Moffit, St. Louis, Missouri; patented Nov. 30, 1852; re-issued March 23, 1858.

Claim—1st, The endless chains, composed of metallic links provided with protuberances or depressions when used in combination with suitable driving pinions to impart a positive motion to the straw carrier of a threshing or separating machine. 2d, In combination with a receptacle in which the tailings are deposited by the winnowing apparatus; also, the arrangement of the screw elevator in relation to the threshing cylinder, for the purpose of returning the tailing to be re-threshed.

9. Railroad Car Wheels; Wm. B. Treadwell, Albany, New York; patented January 9, 1849; re-issued March 30, 1858.

Claim—The forming of such wheels with a hollow concentric annulus or ring, the plates forming a curve to yield by bending to the unequal contraction, in combination with the connexion thereof, with the rim at or near the middle of its width, by means of the solid ring to give the required support to that part of the rim which is most exposed to fracture in use. Also, in combination with the hollow annulus or ring connected with the rim by a solid ring, the inner hollow annulus or ring next to, and connected with, the hub, and connected with another hollow annulus or ring by a solid ring, whereby ample provision for yielding to the unequal contraction is obtained, while at the same time the metal composing the wheel is so disposed as to prevent in a great measure the injurious effects of vibrations, and to resist the jars and concussions to which the railroad wheels are exposed in use.

Designs.

1. Carriage Hub Sand Bands; James Ives, Mount Carmel, Connecticut; dated March 9, 1858.

Claim—The curved form or ornamental configuration of carriage hub sand bands.

2. Copying Press Stand; Charles H. Clayton, City of New York; dated March 23, 1858.

Claim—The press stand foot, consisting of the harp or vase-shaped figure formed by the two reverse curved bands, with the shell, the two figures, and the joining scrolls, all supporting and connected with each other, and forming one harmonious design.

3. Legs and Posts of Iron Bedsteads; John P. Kock, City of New York; dated March 23, 1858.

Claim—My design for feet and posts for iron bedsteads, consisting of the scroll work, stand and brace, with a praying angel kneeling between the latter, for the posts of iron bedsteads, and the figure of an eagle, with outspread wings, resting upon arabesque scroll work, and carrying a corresponding capital on its head, and the ends of the wings for the centre feet.

APRIL 6.

1. Corn Harvesters; Isaac V. Adair, Varick, New Jersey.

Claim—Attaching the cutter to the rods, the rods being provided with arms, and the rods and arms operated from the wheels through the medium of the gearing and arms, when the above parts are used in combination with the stationary cutters, at the inner parts of the recesses. Further, the bar provided with the arms, in combination with the gate, the above parts being attached to the platform, and used in connexion with a railing or guard. Also, the cutting device formed of the cutters connected with rakes or teeth, in combination with the discharging device formed of the gate and bar.

2. Sewing Machines; Abraham Bartholf, City of New York.

Claim—The construction of the taper portion of the shuttle, and the forked portion of the shuttle driver which acts upon it to drive it back, so that the said portion of the driver bears upon the top and bottom of the shuttle with a tendency to draw it away from or prevent it hugging the side of the race way. Also, giving the two claws which produce the backward motion of the shuttle, a relative form, by which the shuttle is prevented hugging the bottom of the race way.

3. Syrup Casters; Edmund Bigelow, Springfield, Massachusetts.

Claim—The measuring faucet or register, in combination with the revolving syrup fountain or reservoir.

4. Traps for Animals; John Le Brabyn, City of New York.

Claim—A tilting platform, in combination with the enclosed recess, when the platform is comprised of the inclined plane and horizontal floor.

5. Grinding Mills; D. E. Breinig, Philadelphia, Pennsylvania.

Claim—1st, The upper portion of the grinding surface of the shell and buhr cone-shaped, with inclined sides terminating in a horizontal curved grinding surface, in combination with the deflecting arms. 2d, The shell and buhr formed, in combination with the scraper, sliding segments, and pinions.

6. Apparatus for Roasting Coffee; Robert Brown, Ashtabula, Ohio.

Claim—The vessel, provided with the adjustable rotating scrapers or blades attached to rods of varying lengths, which rods are pivoted to the shaft.

7. Churns; Harvey Brown, City of New York.

Claim—The arrangement of the trailing paddles, wheels, and gearing.

8. Attaching Expansible Cutting Lips to Augers, &c.; Nicholas Clare and John Quigley, Malden, N. Y.

Claim—The detachable and adjustable reamer or plug borer.

9. Clasps for Fastening Bags; Wm. H. Cloud, A. L. Hatfield, and C. H. Burdick, Fremont, Ohio.

Claim—The peculiar construction of semicircle with thin edge to prevent slipping, and hinge at one side, clasp and catch on the other side; the peculiar construction of lever, so as to be operated upon by the pressure of the bag when fastening, and thumb-piece, by which it is easily opened.

10. PEN AND PENCIL CASES; John Cockburn, City of New York.

Claim—The arrangement and combination of a pen-slide, which girdles its tube with a boss, which latter girdles its tube.

11. SECURING POCKET-BOOKS, &c.; Oliver Cox, Alexandria Co., Virginia.

Claim—The lock constructed and attached to the pocket-book, &c., in combination with the button, for the purpose of attaching pocket-books, porte-monnaies, and purses to the pocket of the wearer.

12. HAND CORN PLANTERS; Daniel C. Coppin, Cincinnati, Ohio.

Claim—The combined arrangement of the concave plate, lever, and seed rod, arranged with the pipes and spring.

13. PORTABLE PUMP; Wm. Douglas and Benjamin Douglas, Middletown, Connecticut.

Claim—The pipes and the chamber, provided with the flexible cover and lever, and the caps; the parts being constructed and arranged relatively with each other.

14. SAW GUMMER; M. Ernsberger, Bremen, Ohio.

Claim—The stock provided with the screws, also provided with the tube, collar, pin, and the shaft, with cutter formed on it.

15. HARDENING IRON AND STEEL; George James Farmer, Birmingham, England; patented in England, August 23, 1856.

Claim—The hardening of articles formed of iron or steel, by plunging them into a solution of prussiate of potash, sal-ammonia, and saltpetre, after they have been heated red hot, and rolled in a powdered mixture of the same materials.

16. REFRIGERATORS; Wm. Ferris, Philip Garrett, and James Megratten, Wilmington, Delaware.

Claim—The combining the third or inner box or frame with the interior of a refrigerator, so that a perfect circulation of cold air may be kept up in the interior of the box or case.

17. COTTON PRESSES; Wm. Field, Providence, Rhode Island.

Claim—1st, The arrangement of the chains connecting the followers, so that by applying power and motion to one follower it is transmitted to the other; and also, the followers retain their parallelism to each other, however unequal the resistance at either end. 2d, The combination of the screw for raising the upper follower with the chains for raising the lower. 3d, The guard plates, in combination with the followers.

18. SEEDING MACHINES; Joseph Fry, Battle Creek, Michigan.

Claim—The device of using a screw with double thread, coarse and fine, alternately, in the bottom of the seed hopper, in combination with the oscillating hand lever and the eccentric pivot, to force the seed through the holes in the perforated bottom of said seed hopper, by means of the compound oscillating motion of the screw.

19. BOX-CASES AND LUBRICATORS FOR RAILROAD CAR AXLES; G. W. and J. C. Geisendorff, Cincinnati, Ohio.

Claim—The employment of the divided packing, in combination with the springs.

20. PROTECTING TILLER ROPES OF VESSELS FROM FIRE; W. Y. Gill, Henderson, Kentucky.

Claim—Enclosing the tiller ropes of steam vessels, by a double tubing connected with double boxes to form the necessary elbows, the spaces between the tubes and boxes being filled with a proper non-conducting material.

21. PIPE TONGS; Henry H. Gilmore, Boston, Massachusetts.

Claim—The combination of an inclined plane or planes, or the equivalent thereof, with the slotted jaw.

22. PUDDLING FURNACES; John P. and John Grove, Montour County, Pennsylvania.

Claim—1st, The employment of a revolving bottom for a puddling furnace, arranged with water tubes for cooling it, and with the peculiar air-tight joint. 2d, The employment in a puddling furnace of a revolving tool.

23. BOOT-JACK AND BURGLARS' ALARM COMBINED; F. C. Goffin, Newark, New Jersey.

Claim—The bed, jaws, treadle, pendant, slide, and spring, whereby the article serves the double purpose of a boot-jack and door alarm.

24. LANTERNS; A. H. Golden, Lafayette, Indiana.

Claim—The bow or ball pivoted to the upper part of the lantern, and provided with the plate or shield and clamp, whereby the lantern may be readily secured to the arm of the person desiring its use, and the person have the control of both arms and hands, and at the same time have the full benefit of the light.

25. HORSE COLLAR BLOCKS; E. D. Gould, Darien, New York.

Claim—A collar block so constructed as to shape the interior of the front of the collar, and the interior of the rear of the collar next to the front, and the interior only, and stretch them at the same time, and hold them firmly in the form required, while the rear or belly of the collar is manipulated by hand, and worked and beat into the form required with a mallet, and other suitable tools.

26. RAILROAD STATION INDICATOR; N. J. Becker, Florida, and J. M. Harvey, Amsterdam, New York.

Claim—1st, The arrangement of a series of separated, printed, indicating cards, plates, or boards, on a flexible endless belt or chain, and having the same revolve over a flat, square, or many-sided revolving shaft within a case which has a transparent front. 2d, The employment of a self-adjusting forked rod leading down to the railroad rails, and furnished with a catch on each prong, in combination with projections on the corners of the square or many-sided shaft, a reversing cam, and double inclines or bevel stops, arranged along she track at the different stations or streets. 3d, The combination of a spring, self-adjusting bell hammer, and bell, with the square or many-sided shaft and its projections.

27. CONVERTING RECIPROCATING INTO ROTARY MOTION; Forest H. Harwood, Rushville, New York.

Claim—The arrangement of a revolving eccentric ring or band, with edge clips of a reciprocating rod, or its equivalent, for operation together to produce a revolving motion from a reciprocating one, and the reverse. Further, the combination with the reciprocating clips of the rod having a radial action to the ring shaft of the endless band, arranged eccentrically to its shaft, when said band is made of diminishing thickness in opposite directions from its dead points or portions, for operation with the clips. Also, connecting the revolving eccentric ring or band that reciprocates the clips, or is revolved by them with its shaft, by or through the fly-wheel which aids the ring in passing its dead points or centres, whereby the fly-wheel is braced by the ring, and more immediate relief is given to, and generally diffused over, the latter.

28. POTATO DIGGERS; Lewis W. Harris, Waterville, New York.

Claim—The employment or use of a share and drag. Further, in combination with the share and drag, the supplementary shears.

29. REEFING SAILS; Lewis Higgins, Jersey City, New Jersey, and Alexander Brown, City of New York.

Claim—1st, The truss frame, constructed and fitted with a series of rollers, which embrace the yard and rolled-up portion of the sail to hold the yard to the mast, but to permit the rolling of the sail thereon without the necessity of dividing the sail down the centre. 2d, The combination of the rings which carry the traveling leads with the yard and with the truss, by means of the collared bands and the rolling stays, to prevent longitudinal movement of the yard, and the rolling of the traveling leads with the yard.

30. ROW LOCKS; James H. Hills, Burlington, Vermont.

Claim—The arrangement and combination of half rings and set or adjusting screws, and the suspension and operation of the oar at point.

31. COUPLING PIPES; W. Hudgin, Washington City, D. C.

Claim—Effecting the combination of the main and branch pipes, by means of an open coupling, which is furnished with an enlarged passage to receive the main pipe, a passage to receive or communicate with the branch pipe, and a set-screw or wedge and key, and suitable packing to make a tight joint, and always maintain the same.

32. HOLDING AND FEEDING THE BOLT IN STAVE MACHINES; A. Hupp, Lancaster, Ohio.

Claim—The combined arrangement of the levers, catch rod, and slides, arranged with the lever and pawl, ratchet wheel, cord and plate, all for holding and feeding the timber to the cutter.

33. MACHINE FOR CUTTING FILES; J. N. Jacobs, Worcester, Massachusetts.

Claim—1st, The wedge at the top of the toggle, by which the cutter is operated and combined with a foot-piece, with its shoe resting upon the file blank or file, by means of mechanism, and with a loaded lever, for the purpose of controlling the depth of cut throughout the whole length of the file. 2d, Supporting the file blank or file upon a rolling bed fitted to a carriage with rollers interposed, for the purpose of insuring an uniform depth of cut all across the file. 3d, The combination of the rocking shoe of the foot-piece with the rolling bed. 4th, The cam combined with the wedge foot-piece and shoe, by mechanism, for the purpose of raising the cutter and the shoe of the foot-piece from the file or blank, to prevent injury during its return.

34. ICE PITCHER; Ernest Kauffman, Philadelphia, Pennsylvania.

Claim—The ice pitcher, having the inner portion or lining fitted to the outer portion or casing with screw threads, which make a tight joint, but provide for its ready removal and replacement or renewal.

35. MACHINE FOR CRIMPING TOBACCO; R. Kinsley, Springfield, Massachusetts.

Claim—The employment of one or more pairs of rollers for equalizing and crimping rolls in the manufacture of lump tobacco.

36. PIANO-FORTE ACTION; Henry A. Leaman, City of New York.

Claim—1st, The attachment of the hammer of an upright piano-forte action to the rear extremity of the key, and the arrangement of the notch in the back side of the butt of such hammer, so that the working face of the notch is in contact with the edge of a stationary bar, and by such operation cause the hammer to move back to strike the string, when the front end of the key is depressed. 2d, In combination with the attachment of the hammer to the rear extremity of the key, the attachment of the damper to the hammer butt below the pivot, which attaches the hammer to the key, whereby it is made to serve as a stop to the hammer, or means of regulating the length of stroke of the hammer, and depth of level of the key. 3d, The application of the regulating screw in the rear end of the key, to operate in combination with a portion of the hammer butt, extended below the pivot which attaches the butt to the key. 4th, The arrangement of the damper lever, behind the downwardly extended portion of the hammer butt.

37. ATMOSPHERIC PRESSURE DENTAL PLATES; M. Levett, City of New York.

Claim—Attaching plates of artificial teeth by means of separate cells or cavities acting upon the alveolar ridge.

38. SEEDING MACHINES; Isaac B. Lutz, Lafayette, Indiana.

Claim—The rotating rods provided with two screw threads placed in reverse positions, and so arranged as to discharge the seed at both ends of their seed boxes. Further, the seed boxes attached respectively to the adjustable bars and beam, and provided with seed distributing screw-rods, operated from the driving wheel through the medium of the gearing.

39. SMUT MACHINES; Samuel B. Manning, Alleghany City, Pennsylvania.

Claim—The use of a cone placed above the distributing cup to prevent any eddy or interruption of the draft of air, which cause the deposit of the screenings and dirt in the cup.

40. VISE-ANVIL FOR REPAIRING T-RAILS; Sanford Mason and E. M. Davis, Michigan City, Indiana.

Claim—The combination of the guard on the lever jaw, and the groove in the bed-piece, with a raising mechanism for raising up said lever jaw. Also, in combination, the projection on the lever jaw, and the groove on the locking jaw, so that when the jaws are raised up they will open to receive the rail, and when released will catch and firmly hold themselves and the rail to the bed-piece.

41. CORN SHELLERS; Thomas W. McFarlan, Salem, Ohio, and Levis H. Davis, West Chester, Pennsylvania.

Claim—1st, The gutter-shaped guard, arranged between and underneath the bevel picker wheels, and overlapping the head of the vibrating riddle. 2d, Having the head end of the riddle rest upon a horizontal projection of an inclined board. 3d, Lining the spouts or chutes of the head with a thin, pivoted, or yielding metal lining.

42. FENCE POST; R. Merrill, Elmira, New York.

Claim—The shoe or foot plate with deflected parts and slotted openings, in combination with the skeleton post and flanches.

43. HARVESTERS; W. K. Miller, Canton, Ohio.

Claim—The combination of the draw bar and cutter bar, when the same are balanced upon the sustaining shoe, and hinged to the axle of the driving wheel, distinct from the bounds of the draft tongue, with the tongue so attached that the line of its draft will be equi-distant from the central longitudinal lines of the driving wheel and sustaining shoe, the several parts being constructed and arranged with respect to each other.

44. THRESHING MACHINES; John R. Moffit, St. Louis, Missouri.

Claim—The construction and arrangement of the metallic gearing frame, provided with arms and attached to the machine.

45. COATED METAL PLATES; Edmund Morewood and George Rogers, Enfield, England; patented in England, July 27, 1855.

Claim—The new article of manufacture, termed coated metal plates, consisting of sheet metal prepared and coated with a mixture of repellant and preservative coating, the said coated sheet metal being intended as a substitute for many purposes for tin plates, galvanized iron, or other articles of that description, produced by dipping sheets of metal into melted metals.

46. MACHINE FOR SPLITTING WOOD; Franz Noette, Brooklyn, New York.

Claim—The intermittingly rotating table or bed, in combination with the vertical reciprocating cutter shaft.

47. REMOVABLE RAMMER OF REVOLVING FIRE ARMS; Henry S. North, Middletown, Connecticut.

Claim—Having the rack and passage or chamber made in the head of the base pin, thus rendering the rammer independent of every other part and facilitating its removal.

48. MACHINES FOR PLANTING POTATOES; Jesse W. Pelletreau, East Moriches, New York.

Claim—The general arrangement of the hopper and automatic dropping apparatus, consisting of the spouts, clappers, wheels, and blocks, in connexion with the opening and covering ploughs, whereby the potatoes or pieces of potato being fed into the machine by hand are not injured, and all the advantages of hand planting are attained, without the laborious work connected therewith.

49. CROSS-CUT SAWING MACHINES; H. H. Potter, Carthage, New York.

Claim—Operating the saw by means of the bent lever, in connexion with the feeding device formed of the levers and guide.

50. SEEDING MACHINES; Thomas A. Risher, Circleville, Ohio.

Claim—The peculiar arrangement of the bars, with the right and left screws, slides, with its stirrer, for the purpose of regulating the quantity of grain with uneven slides.

51. SEEDING MACHINES; Thomas A. Risher, Circleville, Ohio.

Claim—The peculiar arrangement of the bottom, as constructed, with the rock slides, handles, rods, set-screw, and bottom.

52. FIELD-FENCE; Benning Rowells, Ossian, New York.

Claim—The method of connecting the panels and the braces with each other, by interlocking the upper and lower rails with the brace post, whereby the panels are firmly connected with each other, and interlock with the posts, without the aid of independent connecting devices.

53. COTTON SEED PLANTERS; James Ross, Midway, Alabama.

Claim—The combination of the hollow shaft and arms, flanches, shaft, discharge plate, and mechanism vibrating the same.

54. WALLET FASTENER; Jacob T. Sargent, Carlinville, Illinois.

Claim—The combination of the spring catch and the attachment plate, the same constituting a safety apparatus. Also, arranging the spring catch and attachment plate, and making the said catch with a bend or recess, disposed with respect to the attachment plate.

55. SEWING MACHINES; Elliot Savage, Berlin, Connecticut.

Claim—Forming a chain-stitch seam by the looper, when operating in combination with an eye-pointed needle, so that the looper shall enter the open loop as the needle rises, and while resting on the bed plate securely hold the first loop open in the path of the needle, and release the loop when the needle shall have entered to form a new stitch. Also, the specific device for regulating the tension of the thread in sewing machines, consisting in a spool supporting bracket, in relation to, and operating in, connexion with a screw-threaded standard, in such a manner as to ascend or descend when rotated around and upon said standard, for the purpose of causing the thread to be wound around said screw until the requisite degree of tension is obtained.

56. GRAIN SEPARATORS; Francis Schunks, York, Pennsylvania.

Claim—The screens, placed in adjustable frames, operated by the cam, levers, and springs, and arranged relatively with each other and the fan, spout or passage, and board.

57. PLOUGHS; Thaddeus S. Scoville, Elmira, New York.

Claim—The combined arrangement of the loosely turning spur wheels, the separating washers, and the clearing teeth, acting upon, or close to, said washers, so that the eccentric movements of the said spur wheels, together with the said closely fitting washers and clearing teeth, will effectually keep the implement free from impediment.

58. LOCK; E. M. Shaw, Baltimore, Maryland.

Claim—The plate, spring plates, pins, and hollow stem.

59. RAILROAD STATION INDICATOR; Charles J. Smith, North Prairie, Wisconsin.

Claim—The shifting lever or bar, and the mode of adjusting it by means of the index finger at the end of the crank shaft, in such manner as to cause the rollers or cylinders to revolve in opposite directions, by means of the same application of power, in combination with the pin or stops upon the lever, and the slots or openings in the aforesaid shifting lever or bar.

60. HAND PRINTING STAMP; Benjamin B. Stanton, City of New York.

Claim—Moving the die from the inking pad to the printing pad and backwards, by means of the spool through which the stamping rod passes, operating in a straight line between parallel guides, arranged for that purpose upon a stationary arm over the inking and printing pads. Also, in combination with the sliding spool, the catch.

61. CARPET HOLDER; Horace Thayer, Warsaw, New York.

Claim—The arrangement of the spring, tube, clasp, and slide, forming a carpet holder.

62. IRONING TABLE; Wm. Vandenburg, City of New York.

Claim—The ironing table composed of a board rigidly attached at one end to a stand, which is provided with a movable support for the other end of the board.

63. HARVESTERS; Isaac Van Doren, Somerville, New York.

Claim—The arrangement and connexion of the movable part with the fixed part, by means of the two connecting curves, to secure proper motion to the part, without any necessary support or connexion from the centre. Also, the parts, and the secondary movable part, to bring the sickle, whatever its position on the curve, level with the cutting surface. Also, in combination with the parts, the use and application of the universal joint in connecting the sickle lever to the machine to allow of the change in the position of the sickle.

64. LAMP ATTACHMENT; Wm. W. Wade, Long Meadow, and Charles Burnham, Springfield, Massachusetts.

Claim—Securing the deflector into the groove of the chimney band, the said band being hinged to the lamp cap.

65. PLOUGHS; J. C. Williamson, Washington, Georgia.

Claim—The combination of the plough iron, brace, and cutter or share, when formed and united together, and to the beam.

66. COUPLING OF SHAFTING FOR PROPELLERS; Seth Wilmarth, Charleston, Mass., Samuel L. Hay, Reading, Pennsylvania, and David N. B. Coffin, Jr., Newton, Massachusetts.

Claim—The combination of plated, or its equivalent, with the head plates of the shaft, so that the coupling may accommodate itself to the angular and transverse variation between the driving and driven parts of the shaft, whether that variation be variable or permanent.

67. PISTONS FOR STEAM ENGINES; Ross Winans, Baltimore, Maryland.

Claim—The combination of self-setting packing, that, unaided by the skill of the engineer, will adjust itself into close contact with the cylinder, and bear against the same with the proper force; of means for binding this packing firmly in place when it has set itself out, and for slackening it again when necessary to allow it to rest itself; and of means by which the packing can be easily loosened and tightened, without removing the cylinder head, whereby the packing of the piston of a locomotive can be adjusted better and in less time than by any combination previously invented.

68. LOCOMOTIVE ENGINES; Ross Winans, Baltimore, Maryland.

Claim—The combination of a foot-board, located below the usual level of the platform of the tender and the surface of the grate, with a fire-box and grate adapted to the burning of coal as fuel, whereby the interior of such a fire-box, and the grate thereof, can be more readily reached by the fireman, and his duties be performed with greater expedition, convenience, and effect. Also, the combination of an ash pan, open at its hinder end, with a foot-board located below the grate and the usual level of the platform of the tender, whereby the lower side of the grate, and the space beneath, can be inspected and reached by the fireman while the engine is in motion.

69. GRATES FOR STEAM ENGINES; Ross Winans, Baltimore, Maryland.

Claim—The grate of a locomotive engine, composed of a series of narrow sections, each containing two or more bars and supports therefor, the sections and their supports to permit each section to be rocked independently of the others, by means of a hand lever applied outside of the fire-box. Also, the construction of the series of bars of the grate and the bearers for supporting the same, so that any member of the series may be rocked upon two axes, without contracting the narrowest part of the spaces between it and the adjacent stationary members of the series.

70. DOOR BOLTS; John Woolman, Philadelphia, Pennsylvania.

Claim—The arrangement of the flat or elliptical bolt, contained and moving within suitable straps or casings, with an eccentric motion when operated and moved by means of the handle or lever.

71. MACHINERY FOR BOLTING, DUSTING, AND SEPARATING THE GROUND MATERIAL; Joel Woodward, Philadelphia, Pennsylvania.

Claim—1st, The stationary brush or distributor. 2d, The brush, so arranged as to carry the meal or bran to or from the centre, whereby the substance can be secured or brushed as much as desired. 3d, The manner of making any number of separations, or any mode of combining more than two separations in the duster or separator. 4th, The manner of the corresponding bottom or platform below, with sweeps or scrapers to carry the flour to spouts. 5th, The mode of regulating the brushes on the wire or cloth by the bolts or set-screws, and the screw at the bottom of the shaft, and to be used as in the specification.

72. GUIDING RECIPROCATING SCROLL SAWS; John C. Cline, Assignor to self and Samuel Rhodes, Philadelphia, Pennsylvania.

Claim—The employment of a cap, in combination with a tubular guide.

73. CUTTING DEVICE FOR REAPING AND MOWING MACHINES; Thomas Harding, Assignor to Warden, Brokaw & Child, Springfield, Ohio.

Claim—The arrangement of the end of the sickle bar next the divider of a cutting and clearing section.

74. STRAW CUTTERS; Joseph B. O. Key, Indianapolis, Assignor to self and W. Y. Wiley, Marion Co., Indiana.

Claim—The combination and arrangement of the box, gauge, and knives, upon the drum or wheels.

75. LAMPS; Pascal Plant, Assignor to self and Peter Hannay, Washington City, D. C.

Claim—Forcing a current of air through the lower or blue part of the flame, by means of a cap-piece constructed and arranged in relation to the wick tube.

76. LANTERNS; Jacob H. Righard, Assignor to self, John Bird, and David Challiner, Birmingham, Penna.

Claim—Making a circular convex projection in the side of the globe of a lantern, cast or moulded in one piece with the globe (which is to be silvered externally as a reflector), the edge of which circular projection is slightly raised from the surrounding surface of the globe, so as to permit of the convenient attachment of a cap or covering to protect the silvered surface of the reflector from injury.

77. LAMPS; Robert Steinman, Assignor to self and N. P. Wax, Boston, Massachusetts.

Claim—1st, The arrangement of the elevated reservoir with its filter and passages of communication. 2d, In combination with the reservoir, the passages, and the oil chamber, the bent tube. 3d, In combination with the elevated hot air reservoir, the plate, for the purpose of regulating the temperature of the fat or oil.

78. GRAIN SEPARATORS; Josiah Turner, Sunapee, Assignor to self and Edmund Burke, Newport, N. H.

Claim—The upward, inclined, revolving straw carrier, in combination with the vibratory lattice and the adjustable lattice.

79. PORTABLE GAS RETORTS; Davis L. Weatherhead and James T. Henry, Assignor to selves, John M. Smith, and Wm. P. Campbell, Philadelphia, Pennsylvania.

Claim—The exterior horizontal cylinder in combination with the interior horizontal, perforated cylinder,

charged with pumice, when the cylinder is so constructed and arranged that the material from which the gas is to be made shall flow into the annular space between the two cylinders, and the gas, when generated, shall pass through the body of porous material for the purpose of purification.

APRIL 13.

80. AWLS AND TOOLS; Herrick Aiken, Franklin, New Hampshire.

Claim—The form, shape, construction, combination, and arrangement of the set of awls and tools (twenty in number), for the purpose of connecting them with a handle having a receptacle in the large end to contain the said awls and tools, and a socket and gripe secured in the other end to confine and hold the several awls and tools for use, as occasion may require. Also, making the shanks of the awls and tools square, with parallel sides serrated and equal in size, for the purpose of inserting them into a gripe connected with a handle, the shanks being serrated so that the gripe will hold them more firmly for use than if the shanks were made plane without the serrating; and these improvements in awls and tools when used in any kind of socket and gripe for holding and changing them.

81. SEEDING MACHINES; Charles F. Anderson, Charlestown, New Hampshire.

Claim—1st, Actuating the seed slides by means of the shaft operated from the wheel by the spur-wheel, pinion, beveled or made of double oblique form on its outer side, the tube or collar provided with the pin, and the zig-zag groove in the shaft, and the spring. 2d, The latch or catch connected with the slides, and used in connexion with the sliding collar, and the boss or shell on shaft. 3d, The blade or scraper attached to the rod, and actuated when desired, by means of the spindle, shaft, link, and spring. 4th, Raising and lowering the frame of the machine, by means of the eccentrics attached to the axle, in connexion with the straps and clutch.

82. SEWING MACHINES; J. E., J. C., and O. Atwood, Mansfield Centre, Connecticut.

Claim—The arrangement of the needle die, the looper, and the stationary finger, in such relation to each other, for the purpose of extending the loops in a position for the needle to enter them without failure.

83. REAPING AND MOWING MACHINES; Charles Beach, Penn Yan, New York.

Claim—The cutters, and with the separator of a harvesting machine.

84. CHAFF SCREENS FOR WINNOWING MACHINES; Alfred Belchamber, Ripley, Ohio.

Claim—Constructing the screen of sheet metal plates or strips, bent or turned over at one edge and slitted or cut at the opposite edge, so that portions may be bent up; the plates being secured in the frame or between the sides, so as to overlap each other.

85. SAWING MACHINE; John L. Beadle, Marengo, New York.

Claim—The combination, embraced in the manner of raising the table, with the manner of adjusting the cross-head and dogs.

86. DOUBLE-ACTING FORCE PUMPS; Eugene Bellamy, St. Louis, Missouri.

Claim—1st, The division piece, as constructed with top and bottom grooves, fitting on corresponding flanches on the lower chamber, and on the adjustable piece. 2d, The cylinder, as constructed with flanches fitting into grooves in cylinder, as a removable cylinder easily removed, so that another can be replaced in case of breakage.

87. DREDGING MACHINE; E. B. Bishop, Shreveport, Louisiana.

Claim—The combination with the bow of the boat of two spirally flanched shafts, for the purpose of dredging or deepening the chambers of rivers, &c.

88. PLOUGHS; Thomas E. C. Brinly, Simpsonville, Kentucky.

Claim—Grass hook and its plate with relation to the beam and mould-board of the plough.

89. RAILROAD CAR SEAT; David Buzzell, Charlestown, Massachusetts.

Claim—An improved railway chain or combination of a stationary seat, a reversible back, two swinging foot-rests, and mechanism, so connecting the said foot-rests and the reversible back as to enable the foot-rests to be operated by the back. Also, making the reversible back in three parts. Also, the application of the springs to the head-rests, such head-rests being provided with latches.

90. WASHING MACHINE; Henry Cassell, Fredericktown, Ohio.

Claim—The arrangement of the spring pawls and grooves on the shaft, and these arranged with the hooks for elevating the pounders and the spring.

91. TRIMMING THE EDGES OF CIRCULAR BOOT TOPS; Perez C. Crapp, Stoughton, Massachusetts.

Claim—The arrangement of the boot board, the movable frame, the slide, and the boot form, for turning the edges of circular and other shaped boot-tops.

92. MOWING MACHINES; Wm. Crook, New Hope, Pennsylvania.

Claim—Securing the driver's seat to the hinged cutter frame of a mowing machine, in such a position as regards the centre of vibration of said frame, that the weight of the driver may act as a counterbalance, or nearly so, to the cutting apparatus.

93. TRUSS PADS; Wm. F. Daily, Baltimore, Maryland.

Claim—1st, Constructing a hollow truss pad or supporter for hernia, with a series of small perforations in its front plate, in combination with enlarged openings in its back plate, so as to allow of some healing substance being brought in contact with the body, and also ventilation, or a perfect and healthful circulation of air through it, and over or about that part of the body covered by and with which the pad or supporter comes directly and constantly in contact. 2d, Attaching the pad to the main spring of the truss or body strap, by means of the combined agency of a recess or groove in the back of the pad, an oblong slot in the main spring, and a single set-screw, whereby every facility of adjusting the pad speedily by simply operating one screw is afforded, and at the same time a liability of the pad twisting round and rubbing avoided.

94. CORN SHELLERS; A. B. Davis, Philadelphia, Pennsylvania.

Claim—The endless band or endless chain of toothed plates, in combination with the angular barred grating, when the same are arranged for joint operation.

95. BASES FOR ARTIFICIAL TEETH; George Dieffenbach, City of New York.

Claim—Making the base for artificial teeth of a composition of matter in which amber forms the principal ingredient.

96. Railroad Car Brakes; Gideon Dorsch, Schenectady, New York.

Claim—Combining the ends of the levers with an endless chain, when said levers are hung.

97. Cop Tubes; James Eaton, Townsend Harbor, Massachusetts.

Claim—A metallic cop tube having corrugations or grooves upon its surface, formed by corresponding knife edges upon the face of the die in which the tube is made.

98. Harvesters; D. W. Entrikin and Lewis H. Davis, West Chester, Pennsylvania.

Claim—1st, The combination of shaft, curved attachment, lever, pulley, tongue, and ratchet. 2d, The combination of the slotted piece upon the main axle with the crank working in said slot. 3d, The combination of the rollers above and below the tongue with the vertical plates.

99. Cutting Device for Harvesters; D. W. Entrikin and Lewis H. Davis, West Chester, Pennsylvania.

Claim—In combination with the roughness upon the surface of cutter bar and cutters, arching the finger and extending it back upon the bar, and the hollowing out of the finger under the cutter bar.

100. Hay Knives; John Fasig, Jackson, Ohio.

Claim—The angular knife, it being attached to the shank.

101. Spring Bed Bottom; Elbridge Foster, Hartford, Connecticut.

Claim—The arrangement of the side and end springs, that is, so that while one set of springs shall be attached to the middle parts of each to the frame, and be made to bear at their ends against the bars, the other set shall be attached at their middle parts to the bars, and be made to bear at their ends on the frame.

102. Water and Fire-proof Safe; John T Garlick, City of New York.

Claim—1st, Combining a series of air cells or spaces with a filling of non-conducting material in a safe having a door or doors closing water-tight, to render the same sufficiently buoyant to float in the water, and also to resist the action of heat and prevent the heat communicating to the articles stored in the safe. 2d, The combination of the safe with the the loose bed or button piece.

103. Seed Drills; John Harris, Shippensburgh, Pennsylvania.

Claim—Having the spring bar attached fast to the upper part of main relief connecting bar of the drill tooth by one end, loosely connected at its other end to the upper end of the drill tooth, by means of a curved hook on the tooth and a slot in itself.

104. Railroad Car Couplings; Albert Hebbard, Galesburgh, Illinois.

Claim—The combination of the round or oval ring or clevis attached to the bumper, the hook of the bumper the same to act as a self-coupling, the latch, and the clutches, so as to enable any one to use the bumper and ring as a self-coupling.

105. Alarm Lock; Horace L. Hervey, Windsor, Connecticut.

Claim—1st, The pin-wheel. 2d, The slotted dial, either plane, pointed, or corrugated on its face, in combination with dial holder. 3d, The piece on the rear end of knob shaft, and working on the face of dial, or through the slot on dial, for operating the pin-wheel. 4th, The dial, illuminated or not, and index hand, when arranged and operating in connexion with inside dial. 5th, The manner of changing the lock into a common spring lock, by means of pin.

106. Chronometric Lock; A. Holbrook, Milford, Massachusetts.

Claim—1st, The use in the construction of automatic and chronometric locks of jointed release levers, so arranged that their action when released shall be from the time work, and so that the releasing of either lever from its rest or the time work shall release one end of the crescent. 2d, The retaining of release levers while the lock remains locked upon fixed or adjustable rests, which shall receive all pressure necessary to insure the action of the levers when released by the time work. 3d, The use of a crescent, so arranged that the releasing of either end of it shall also release the unlocking spring or springs unlocking the lock. 4th, The use of a spiral grooved cylinder (operated by time work,) with the base on bottom of the spiral grooves full and entire, without notch or cavity. 5th, The use of a hollow cylinder locking bolt, revolving loosely in the bed when locked. 6th, The adjusting springs. 7th, The arrangement of a guide, or its equivalent, with its guides and unlocking springs between the unlocking bolts. 8th, The spiral spring bolt, operated from the outside of the lock plate, for the purpose of retaining the locking spring compressed till closing the door.

107. Wheelwrights' Machine; Samuel Holl, Reading, Pennsylvania.

Claim—The sliding feed rests, or anything essentially the same, in combination with the devices of the open ended shaft, bevel gearing check screw, and nuts; also, feed screw, shaft, spur gear, and guide. Also, the combination and arrangement of the device for cutting tenons and boxing hubs, without removing the wheel from the machine.

108. Water Filterers; A. Jaminet, Florisant, Missouri.

Claim—Combining one or more double chambered preparatory separating vessels, with one or more filtering vessels, and furnishing both sets of vessels with puppet or other valves, and operating said valves by means of tilting troughs through the agency of the weight of the filtered water.

109. Machine for Excavating and Washing Gold; S. Johnson, City of New York.

Claim—The chain and buckets in their peculiar form of construction and method of operation, in combination with the pump.

110. Bee-hives; Kimball P. Kidder, Burlington, Vermont.

Claim—The particular construction of the hive, so that the smaller portion may fit within the larger portion, and leave a dead air space between them, or raised up and supported on the division or partition boards to form two hives. Also, in combination with the hive, the device for regulating or entirely cutting off the ingress or egress openings, said device being susceptible of four distinct adjustments.

111. Bonnet Frames; W. E. Kidd, City of New York.

Claim—Making ladies' bonnet frames of two thicknesses of cape lace.

112. Throttle Valve; T. S. La France, Elmira, New York.

Claim—The series of chambers in the valve seat, in combination with corresponding chambers or passages in the valve shell, and the bracing and binding partitions.

113. Mode of Constructing Trunk Handles; S. Lagouritz, Newark, New Jersey.

Claim—The thin leather shell, prepared, packed, and stitched.

114. STRAW CUTTERS; John R. Landis, Lancaster, Pennsylvania.

Claim—A yielding bed or bottom in the feeding trough or box connected to, and depressed by, the lower feeding roller as it is forced down by the material fed into the machine. And in combination with the above, the rotary cutting apparatus, arranged to receive the fodder cut, and cut it still finer.

115. TRACK CLEARERS FOR MOWING MACHINES; A. Marcellus, Amsterdam, New York.

Claim—Operating the plate or board from the driving wheel.

116. DOOR FASTENER; George W. McGill, Buffalo, New York.

Claim—1st, The formation of blade with its peculiar connexion with blade. 2d, The use of the blade, and operating in connexion with screw, and blade, and screw.

117. GRAIN AND GRASS HARVESTERS; H. Marcellus, Amsterdam, New York.

Claim—The V shaped ledges secured in any proper way between the fingers at their back parts, in combination with the oblique sides at the back parts of the cutter teeth.

118. MACHINE FOR HOISTING AND DUMPING COAL; George Martz, Pottsville, Pennsylvania.

Claim—1st, The employment, in combination with the car and dumping chute, of the peculiar arrangement of mechanism, consisting of the sliding gate, pivoted platform, confining catches, trip bar, tilting or dumping stop. 2d, The employment of the tilting or dumping stop bar, whether yielding or stationary, above the front of the platform. 3d, Having the sections of the railroad attached to the platform, so that they may rise and come in contact with the wheels of the car, and cause the car to assume a proper lifting position, and also serve for lifting the car, and likewise for holding it from forward or backward play while tilted or dumped.

119. BAR FOR SECURING BANK VAULTS; Wm. Maurer, City of New York.

Claim—The arrangement and use of a revolving hinge plate, to which the bar for securing and strengthening doors is attached.

120. ILLUMINATING IRON ROLLING SHUTTERS; James McIntyre, City of New York.

Claim—The construction of a rolling shutter with its slats of iron and glass combined to obtain the characteristics.

121. FURNACES; James McCracken, Bloomfield, New York.

Claim—The employment of hollow grate bars, in combination with a closed ash pit, so that the air which passes through the said grate bars shall be discharged into the ash pit, and thence pass up between the said grate bars to supply the blast or draft to the fire on the grate bars. Also, the use of tubular bearers for supplying heated air to the inflammable gases at or near the fire bridge, in connexion with a shield-plate, and interposed between the fire and boiler, or other body to be heated, to maintain the inflammable gases at a high temperature until after they are supplied with heated air for their ignition.

122. STENCIL PALLET; J. H. Merriam, Boston, Massachusetts.

Claim—A stencil marker's pallet or pot.

123. CONDUIT JOINT FOR GAS PIPE; Charles Monson, New Haven, Connecticut.

Claim—The new mode of connecting two leading tubes, viz: by a flexible tube and a joint, which will not only allow one tube to be moved into one or more angular positions with respect to the other tube, but so connect the two leading tubes as to relieve the flexible tube from injurious, longitudinal, or tensile strain.

124. CONNECTING RIGIDLY THE END OF METALLIC BEAMS; Samuel Nowlan, City of New York.

Claim—Forming a rigid joint of two metal beams, by pouring molten metal between the tongue of one beam and the mortise of the other, when the sides of the tongue, which have a latch projection, fit on to the sides of a similar shaped mortise and socket, and when the opposite sides of both the tongue and the mortise are corrugated and leave a space between themselves, into which the molten metal is to be poured.

125. CORDS FOR SKIRTS; D. Perry, Paterson, New Jersey; ante-dated October 13, 1857.

Claim—The peculiar hoop-like manufacture of cordage—that is to say, the untwisted fibrous or filamentous core, when compressed and lapped or wound while in that state.

126. GIVING ADHESION TO DRIVING-WHEELS OF STEAM VEHICLES, PLOUGHS, &c.; John T. Price, Rockville, Ind.

Claim—The arrangement of spurs on driving-wheel for steam plough or land carriage, so that said spurs do not interfere with the rolling of said wheel, unless it should slip on the ground, and then when it slips said spurs (aided by the diagonal corrugations tending to force the dirt against them,) to take effect and prevent it.

127 PROCESS OF EXTRACTING FAT OILS FROM SEEDS; John Preston, Dorchester, Massachusetts.

Claim—The employment of either molasses or a sugar syrup.

128. FOG-BELLS; A. C. Rand and R. R. Johnson, Buffalo, New York.

Claim—The arrangement of mechanism No. 1, and mechanism No. 2 (or equivalents,) relatively to each other.

129. SNOW PLOUGHS; Samuel Richards, Philadelphia, Pennsylvania.

Claim—The snow plough having vertical planes made adjustable at the same time both up and down the inclined plane, and from side to side, whereby it is rendered equally effective in passing from light snow to deep snow, and in throwing the snow to either side of the track at pleasure.

130. TIGHTENING THE SPOKES AND FELLOES OF CARRIAGE WHEELS; B. A. Rogers, Shubuta, Mississippi.

Claim—The combination in a wheel of the annular chamber, spoke sockets communicating with said chamber, expanding packing ring, taper axle box, and extended spokes.

131. STRAW CUTTERS; E. P Russell, Manlius, New York.

Claim—The arrangement of knife and feed rollers, when attached for operation and arranged relatively with the feed-box.

132. SEED PLANTERS; Thomas Russell, Waldoboro', Maine.

Claim—Arranging the arm of the rocker shaft, so as to extend and operate in the space between the wheels, in order that such arm may serve to clear the said space between the wheels from earth which may adhere or be taken up therein. Also, in connexion with a hopper made removable from the frame, applying the movable brush to the dropper or valve, by means of an arm extending down from the brush shaft and into the dropper.

133. WRENCH; E. S. Scripture, New Haven, Connecticut.

Claim—The employment within the pawl of a screw-rod.

134. CHAIN SHACKLE; Joseph Snelling, East Boston, Massachusetts.

Claim—The improved connecting shackle or link as made in two parts, and with one of them formed in one piece as a double hook, and with a space between its extremities, and with tenons, and its other part constructed so as to extend into and fill the said space, and lap over the hooks and receive these tenons.

135. COOKING STOVES; James Spear, Philadelphia, Pennsylvania.

Claim—The hollow centre-piece, when connected with the hot air tube.

136. HORSE SHOE MACHINE; George Stiles, Jr., and S. Kneass, Philadelphia, Pennsylvania.

Claim—1st, The employment of the stationary former, in connexion with the reciprocating levers and with the fixed cam. 2d, The employment of the moving swager, fixed swager, for forming and swaging the shoe while on the former, and inclosed at the side in a hollow moving die-box. 3d, The employment of the hollow box plunger in connexion with the former, for creasing and punching the shoe at the same time that the outer edge is finished by the hollow die-box.

137. RAKING ATTACHMENT TO HARVESTERS; Oren Stoddard, Busti, New York.

Claim—1st, The balance frame connected with fingers or arms, or other raking device, in such a manner that the cut grain, by its own gravity, in connexion with the weight or counterpois of the frame, will be made to actuate the raking device, so that the gavels will be discharged from the frame of equal weight, however variable the crop being cut may be. 2d, The peculiar arrangement of the balance frame shaft with clutch, attached pulleys on shaft, cords, fingers or arms, and bar. 3d, The registering device formed of the dial and index, operated automatically from the raking.

138. GAS BURNERS; Wm. Tallman, Cincinnati, Ohio.

Claim—The construction and arrangement of the disk, fixed concentrically within the burner, so as to leave around it a contracted annular passage.

139. SODA FOUNTAINS; C. D. Van Allen and S. Avery, Baldwinsville, New York.

Claim—The apparatus, that is to say, the combination of the reservoirs to contain, the one an acid, the other an alkali, in separated solution pipes, valve, pump champer, elastic cover, aperture, valve, valve cap, pipe, and generator, when the several parts are constructed and relatively arranged with respect to each other.

140. REVOLVING FIRE ARM; Rollin White, Hartford, Connecticut.

Claim—1st, The enlargement of the chamber in the rotating cylinder, or in a portion thereof in a rearward direction, when such cylinder or portion thereof is detached from the breech, and thereby rendered capable by such enlargement of being driven forward into contact with the stationary barrel, for the purpose of preventing windage. 2d, Making the detached breech of the rotating chambered cylinder rotate with the said cylinder. 3d, Constructing the breech of the revolving cylinder with a recess in its face at the back of each chamber, and a notch in its periphery meeting the said recess, so that the hammer swinging in the manner most common to fire arms may strike into the chamber and cut or tear, and thereby explode the cartridge. 4th, The fitting of the hammer to close that portion of the breech which is left open by the notches.

141. LOCOMOTIVE ENGINES; Ross Winans, Baltimore, Maryland.

Claim—The arrangement of the house or position for the engine-man between the fire-box and the forward end of the boiler, to aid in properly distributing the weight upon the wheels in a locomotive engine, with a fire-box of the large size necessary for the economical burning of coal as fuel, and incidentally, to secure other advantages.

142. ROLLING MILLS; John A. Bailey, Boston, Massachusetts, Assignor to James Horner and James Ludlum, City of New York.

Claim—The application of eccentrics to the journals of rolling mill rollers.

143. PRESERVING JARS; J. Borden, Assignor to D. Potter and F. L. Bodine, Bridgeton, New Jersey.

Claim—A preserving jar in which the cup or groove for holding the cement is formed on the exterior from the wall of the jar.

144. OVENS; J. S Browne, Washington City, D. C., Assignor to self and Joseph Kent, Baltimore, Maryland.

Claim—Introducing the draft air in a thin sheet around the top of the oven, whereby the heat which otherwise would radiate from the outer surface of the oven is employed for improving the combustion in the furnace or heater. Also, the strips or plates arranged in the inclosed air spaces, for the purpose of confining the heated air closely to or near the inner case of the oven. Also, the plate.

145. WATCH CASES; Elihu Bliss, Assignor to Baldwin & Co., Newark, New Jersey.

Claim—1st, In arranging the pendant so as to form one of the centres on which the body of the watch turns, and by which it is permanently attached to the outer case, whereby the pendant itself forms a handle to reverse the body of the watch on the outer case 2d, Arranging the case holding the works of the watch within a secondary ring pivoted to the outer case, so that the body of the watch can be turned in a plane parallel to its face, in order to change the position of the figures on the dial plate, when the watch is reversed in the outer case. 3d, The arrangement of the push piece and pin, so as to act on the spring-holding catch of the closed brizzle of the outer case when on either side of the pendant.

146 ROTARY STEAM ENGINES; Levi Matthews, Assignor to self and J. R. Andrews, Antrim, Ohio.

Claim—Hinging the circular piston at its centre to the outside driving ring, by means of a rigid arm or piece projecting from said ring into the annular steam channel of the cylinder.

147. MACHINE FOR ROLLING AND CUTTING DOUGH; Isaac S. Schuyler, Assignor to J. McCollum, City of N. Y.

Claim—1st, The removable guides, when used in combination with the sides of a reciprocating cutter, and operating for the purpose of releasing and securing the cutter. 2d, The perforated discharging plate, either with or without yielding resistance, in combination with the reciprocating cutter, when made adjustable.

148. STEAM GENERATORS; George Scott, Assignor to Scott, Todd & Co, Philadelphia, Pennsylvania.

Claim—The employment of a rotating tubular coil, one end of which is connected with any suitable apparatus for forcing in water, &c., and the other with a suitable vessel to receive the steam generated in the said coil, when this is combined with a furnace so arranged that in the rotation every part of the circumference of the coil will in succession pass over the fire.

149. SIGNS, DOOR-PLATES, &c.; John T. Wellman, Assignor to Charles O. Thompson, Lowell, Massachusetts.

Claim—The new manufacture of door-plates or signs described, to wit: a transparent plate having a backing containing the name or device affixed to said backing, and the backing affixed to the plate.

150. MACHINE FOR MANUFACTURING SPLINTS FOR BROOMS; John W. Wheeler, Assignor to self and C. D. Williams, Cleveland, Ohio.

Claim—The grooved cylinders, the periphery of whose tongues or ribs pass each other, the edges being in contact and acting like revolving shears, when arranged in combination with the delivering combs.

151. WATCH CASES; John F. Watson, Assignor to James Adams, St. John's Square, Clerkenwell, Middlesex Co., England, Assignor to Bigelow Brothers & Kennard, and Palmers & Batchelders, Boston, Mass., Assignors to Baldwin & Co., Newark, New Jersey; patented in England, June 16, 1857.

Claim—1st, Attaching the pendant to the outer instead of the inner case, as heretofore done. 2d, The arrangement of the pivots on which the watch turns, or the springs for holding the body of the watch to the case, in relation to the figures on the dial plate and to the pendant on the outer case.

152. BURGLARS' ALARM; H. Hersh, B. Bauman, and H H. Locker, Lancaster, Pennsylvania.

Claim—The shape and construction of the levers, with their beams and weights, together with the sliding pins, as operating through the levers against the spring.

153. PREPARING MANURE BEDS; Charles F. Spieker, M. D., City of New York; patented in England, August 19, 1857.

Claim—The use of the peculiar process by which I produce, condense, and fix ammonia, and change it into salts of ammonia in ammonia beds made of aluminous earth, silicates of alumina, or the oxides of iron, sheltered from the rain and excessive temperature, and charged with diluted acids or weak solutions of such salts for the acid of which ammonia has a greater affinity than the base with which it was combined.

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154. HORSE HAY RAKES; Nelson E. Allen, Trenton, Wisconsin.

Claim—So connecting a lever which actuates the dog with a clutch that gears with the driving-wheel, as that one operation throws out the dog, and throws in the clutch, and vice-versa, which makes a positive and compulsory rotation of the rake.

155. GEARING FOR HORSE POWER; Cyrus Avery, Tunkhannock, Pennsylvania.

Claim—1st, Forming the main wheel with a wide periphery, cast whole or in sections, so that any desired number of series of intermediate wheels may work within it, one series above another, and each series to gear into the main wheel, thus enabling me, by slipping on or slipping off one or more series of intermediate wheels, to produce very low, very high, or medium velocity. 2d, The method by which the main wheel is kept in position, to wit: by means of a thimble attached to the centre of the bed-plate, in connexion with the flanches upon the lower intermediate wheels, and by the flanch upon the outside of the main wheel in connexion with the circle around and above it, and by the pivot at the top of the main shaft. 3d, The method by which any desired velocity is obtained, namely, by removing or adding one or more series of intermediate wheels.

156. LIFE BOAT; Leverett Ball, Auburn, New York.

Claim—The doors with the life boat, for the purpose of preserving the lives of shipwrecked passengers.

157. DRESSING SAWS; Job Batchelor, Camden, New Jersey.

Claim—The horizontal disk file, and its connexion and combination with the movable parts of the machine.

158. SEWING MACHINES; Charles Frederick Bosworth, Petersham, Massachusetts.

Claim—The jointed rocking feed hand, so as to play freely between and upon two fulcra, when operating from beneath the sewing table, in combination with the pressure pad above said table. Also, regulating the angle of vibration of the feed hand, by means of two stops, one of which is so adjustable as to allow the fulcrum upon which the said feed hand moves to be raised or lowered, thereby diminishing or increasing the feed at pleasure.

159. RUNNERS OF SLEDS; Silas Bullard, Hartland, Michigan.

Claim—Constructing the rear runners of sleighs in separate frames, each frame being hung by link joints to the cross-bar, so as to admit of a fore and aft rising and pitching movement in each runner, which shall be independent of the movement of the opposite runner. Also, the construction of the tie-beam, so contrived as to hold the separate forward runner frames at the proper distance apart, by the fastening bolts near its ends, and at the same time to allow the independent rising and pitching movement in each runner, by making the mortise holes in it so large as to admit the bars to play loosely therein, so as to allow of a slight rolling motion on the axis, or whenever the runners rise or pitch from the irregularities of the ground.

160. COMPOUND AIR-PUMP AND GASOMETER; Samuel Chichester, Poughkeepsie, New York.

Claim—A machine composed of a reservoir and two pumps, whose pistons having their weight proportioned, are combined with a shaft, to which a power of a spring or weight or their constant first mover is applied, by means of a cord or chain, connecting them with a loose pulley on the said shaft, a wheel fast upon the said shaft, a stop for acting on the said wheel to stop the shaft, and a proper contrivance for engaging the loose pulley with, and disengaging it from, the shaft.

161. SHARPENING DEVICE FOR ROTARY CUTTERS; Edward Conroy, Boston, Massachusetts.

Claim—The sharpening device.

162. CROSS-CUT SAWING MACHINE; Richard M. Crosby, Indianapolis, Indiana.

Claim—The combination of the rocking lever, spring, and weight, with the saw frame.

163. COOLING AND DRYING MEAL; John Deuchfield, Oswego, New York.

Claim—The arrangement and combination of the chests, shafts, elevators, fan, and spout.

164. PLATFORM SCALES; Charles H. Earle, Green Bay, Wisconsin.

Claim—1st, Supporting the platform by plates, and connecting the platform with the beam, by means of the bent lever, rod, and arm, or an equivalent device. 2d, The auxiliary weight formed of the chain, in connexion with the cup.

165. DRIVING-WHEELS OF LOCOMOTIVE ENGINES; John F. Elliott, New Haven, Connecticut.

Claim—The combination with the legs of the feet jointed to the said legs and connected together by chains.

166. PORTABLE INVALID BEDSTEADS; Zebulon C. Favor, Chicago, Illinois.

Claim—The arrangement in an invalid cot bedstead, embracing the following several features, to wit: two

slotted straps, two stop pins, two loops, turning thimble eyes, punctured strips, beveled rails, obliquely set pivoted legs, and turning thimble stop catches, and for the purpose of producing an improved new article of manufacture

167. BURNISHER; Charles Frampton, Brooklyn, New York.

Claim—A burnisher for spinning screws.

168. LIFE-PRESERVING BUCKET RAFT; Charles French, Jersey City, New Jersey.

Claim—Furnishing buckets with encircling gaskets or grummets, so that two or more of such buckets may be combined to constitute a float or raft.

169. FIELD-FENCE; Benedict Gabriel, Elmira, New York.

Claim—Constructing the post halves with points having their inner edges wedging, so as to force said points further apart in the act of driving the post into the ground, arranged in combination with the step.

170. TREATMENT OF SULPHURETED ORES; Isaac Gattman, Philadelphia, Pennsylvania.

Claim—The use of sulphuric acid in connexion with the hydrate, carbonate, or sulphate of potash or soda, or with any compound thereof, in the mode of working the native metallic sulphurets.

171. RAILS FOR STREET RAILROADS; John B. Henck, Boston, Massachusetts.

Claim—In a cast iron rail, the combination of the supporting lap and dove-tailed dowel, the said dove-tail being cast on the said lap, whereby the said rails are rigidly locked, and prevented from rising or falling, or moving in either lateral direction.

172. CLENCHING HORSE SHOE NAILS; James Houck, Green Castle, Indiana.

Claim—The use of the post, when constructed with the cap and band.

173. RUNNERS OF SLEDS; John Hoyt, Fishkill, New York.

Claim—1st, The combination of the headed noddle pin with the dog-joints and the frame bob. 2d, The combination of the noddle pin with the jointed reach. 3d, The attachment of the rear bob to the double-cranked axle, and to the body of the sleigh.

174. STEAM GOVERNOR; R. D. Jacobus, Newark, New Jersey.

Claim—Using a distinct motive power from the main engine, with the motive power of the main engine to operate a governor, in combination with machinery.

175. CENTRE-BOARDS OF NAVIGABLE VESSELS; Benjamin Joline, Westfield, New York.

Claim—Suspending the front end of the centre-board within its trunk, by means of the bridle, in combination with the bolt, slot, or their equivalents, to serve as a guide.

176. OPERATING BLACKSMITHS' HAMMERS; James W. Kerr, Rochester, New York.

Claim—The combination and arrangement of the eccentric with the slotted and reciprocating gate and bellows, whereby the required motions for successfully operating the bellows are obtained by the revolutions of the balance wheel. Also, the combined operation of the wheel with cam or cams, lever bar, hammer lever, hammer, and spring, whereby the power may be reciprocatingly employed between the action of the bellows and trip-hammer, so that the power released from one is expended on the other, and vice versa.

177. UMBRELLAS; Henry Kurth, Brooklyn, New York.

Claim—Making the rib by coiling the wire into loops, which serve like ordinary holes in the rib for the joints, and attaching the stretcher to the middle loop without the interposition of intermediate links.

178. HARVESTERS; H. Marcellus, Amsterdam, New York.

Claim—Connecting the draft bars of the draft pole to the pole plank at a point intermediate between its caster-wheel, at the front end of the pole plank, and the point of connexion of the pole plank with the machine.

179. COMBINED COAL SCUTTLE AND ASH SHIFTER; A. McNeill, Washington City, D. C.

Claim—Constructing a coal scuttle provided with the extended scoop-shaped piece, slide, screen, and cover.

180. POTATO PLANTER; F. S. McWhorter, Smyrna, Delaware.

Claim—The employment of a transverse hopper having an inclined bottom, and arranged on one side of the endless chain conveyor, in combination with a longitudinal guide and retaining box, which has its rear portion inclined and its front portion horizontal, and a brush which brushes off any surplus pieces of potatoes which may collect in the cells or chambers of the endless conveyor.

181. DOMESTIC MANGLE; Samuel Nowlan, City of New York.

Claim—The mechanism of a mangle, constructed and arranged in relation and in combination with parts of any suitable articles of furniture.

182. CORN SHELLERS; E. Parker, Baltimore, Maryland.

Claim—The combination of the cylinder, the spring back, and rollers, when they are constructed and arranged with respect to each other.

183. SECURING TIRES TO RAILROAD CAR WHEELS; L. Pusey, Philadelphia, Pennsylvania.

Claim—The slotted ring, forming a series of openings to admit corresponding parts of the tire passing through said openings.

184. PORTABLE FIELD-FENCE; L. S. Robison, Gypsum, New York.

Claim—My method of constructing a fence which will be portable and easily put up, by means of the panels, with the cross-bars and the blocks on the end of the projecting horizontal bars.

185. OPERATING SEWING MACHINES; P. J. Steer, Washington City, D. C.

Claim—The arrangement for starting sewing machines always in a right direction, and to prevent backward motion with the knee and foot of the operator, and without using the hand for that purpose.

186. RAILROAD RAILS; E. W. Stephens and R. Jenkins, Covington, Kentucky.

Claim—Constructing a tubular rail when the walls are welded, forced, or pressed together from the base of the rail up (or so near together, that when the weight is placed on the rail, in using it, the walls will force together), combined with the walls made concaving on their outside, from near the top of the rail down a short distance below where they are made to meet, for the purpose of making the walls brace inwards, with which combined structure and form of rail we can make a stronger one with the same quantity of metal.

187. Catch Latch for Farm Gates; J. Summers, Raleigh, Virginia.

Claim—The peculiar formed spring plate, in combination with the spring bolt, as an attachment for farm gates.

188. Hollow Cast Iron Cooking Utensils; Adam V. Van Hoevenbergh, Southside, New York.

Claim—A new and improved article of manufacture, to wit: hollow cast iron cooking utensils, kettles, gridles, &c., having the interior surface which comes in contact with the cooking material polished by any of the usual processes for polishing metal.

189. Bit-holder; David H. Whitmore, Worcester, Massachusetts.

Claim—The holder with its cam.

190. Metallic Shoes for the Braces of Truss Girders; T. B. White, New Brighton, Pennsylvania.

Claim—The combination with the diagonal braces in a truss girder of the peculiarly constructed metal male and female shoes and wedges, for the purpose of setting up the braces to give camber to or raise the girder.

191. Quartz Mills; L. W. Williams, Nevada City, California.

Claim—Constructing the inside bottom of circular batteries (in which quartz is to be crushed), of a series of inclined planes or curved surfaces commencing at any desired base, and produced to any required height, and over and in contact with which stampers or wheels are made to revolve, and by their revolution over such inclines are alternately raised and let fall.

192. Curtain Fixtures; Thomas K. Work, Hartford, Connecticut.

Claim—1st, The arrangement consisting of rollers, bar, pin, yoke, case, endless band, and roller. 2d, The plates, constructed with projecting ears, so that the plates may be attached either to the front or side of the window casing as may be desired.

193. Seed Planting Hoes; Samuel Woodruff, Sparta, New Jersey.

Claim—The box provided with the valve and plunger attached to the hoe, and used in connexion with the sack or receptacle placed on the operator, and communicating with the box by means of the flexible tube.

194. Lime-Kilns; B. Zwart, Keokuck, Iowa.

Claim—The construction of a division wall, in combination with the adjoining fire places and walls, to secure the even burning of both sides when desired. Also, the combination of the solid spherical triangle in connexion with the form of the canals, from E down to K. Also, the particular construction of the hot air conductors, in combination with the division wall, and in combination with the draft flues, to procure the horizontal draft of hot air, and make the same serviceable, so as to act direct on the limestone.

195. Machine for Making Wooden Dowel Pins; Amos H. Boyd, Assignor to Samuel F. Chase, Saco, Maine.

Claim—1st, The slotted clamp carriage or bed-piece, in combination with a gang of two or more circular saws for splitting or cutting off wood. 2d, The arrangement and adaptation of said circular cutters, in combination with said clamp carriages and circular saws.

196. Reaping Machines; John W. Brokaw, Assignor to Warder, Brokaw & Child, Springfield, Ohio.

Claim—The combination of an auxiliary platform, with the platform for the reception of the grain as it is cut, when arranged, constructed, and operated in a space between the latter and the driving-wheel.

197. Smoothing and Polishing Iron; Francis A. Cannon, Assignor to John Phillips, Brooklyn, New York.

Claim—The application and arrangement of rollers or cylinders to smoothing and polishing irons, by which a high degree of polish is imparted to linen and other fabrics, with the least expenditure of muscular power.

198. Meat Cutters; Pierre Demeure, Brooklyn, New York, Assignor to Charles Chepy, City of New York.

Claim—1st, The opening in the cover placed near the front part of said cover. 2d, The arrangement of the hinged cover and latches, in connexion with the removable basin. 3d, The arrangement of the cutters acting through slots in the cover, in opposite directions on the meat, &c., to be cut, as the same is presented by the revolving basin.

199. Manufacture of Leather, Paste-Board, and Paper; A. N. Mathieu, Paris, France, Assignor to M. J. A. Guiet, City of New York; patented in France, April 13, 1855.

Claim—Manufacturing paste-board or paper of leather shavings, by simply washing, grinding, and mixing the same with vegetable fibres, without the addition of other manipulation or material, by which I make a cheap and merchantable article, when heretofore the process was too expensive for its profitable use.

200. Method of Ventilating Railroad Cars; Calvin Pepper, Assignor to Nelson R. Scovel, Albany, N. Y.

Claim—The manner of purifying the air as it enters the cars, by passing the same through the pneumometer composed of the tubes in the water chamber.

201. Casting Car Wheels; Robert Poole, Assignor to self and German H. Hunt, Baltimore, Maryland.

Claim—1st, The base of the flask made in sections, so that the centre one may be removed without disturbing the remaining one. Also, the sectional cope, so made that either section may be removed without disturbing the other one. Also, in combination with the sectional base and cope, the central member of the flask with a lining of some non-conducting material.

202. Horse Shoe Machine; Elwin Shaw, Providence, Rhode Island, and C. Carpenter, Jr., Pawtucket, Mass., Assignors to selves and G. B. Justram, Providence, Rhode Island.

Claim—Varying the point at which the pressure for narrowing and thickening the heel commences, by moving the mould in or out.

203. Corn Planters; George Taylor, Richmond, Assignor to self and John W. Free, Laporte, Indiana.

Claim—1st, The combination of parts, shaft, and wheel, with slide, for the purpose of correcting the machine, and making it plant in line with work already done. 2d, The weighted spring arms for correcting the machine, when said spring arms are so situated as to mark midway between the rows of planting.

204. Churn; James Macnish, Berlin, Wisconsin.

Claim—The combination of a central spiral, flanched or winged agitating shaft, with a series of encircling expressing rollers, a portion of which have a direct motion in one direction, while the others have an indirect motion in an opposite direction.

APRIL 27.

205 REVOLVING RETORTS FOR DISTILLING COAL, &c.; David Alter and Samuel A. Hill, Freeport, Penna.

Claim—The use of retorts so constructed, as to revolve continuously on their axis during the process of distillation.

206. LOCK; Ludwig Baier, Cincinnati, Ohio.

Claim—The combined arrangement of the tumblers and guard plate piece, with the bolt.

207. INKSTANDS; John M. Batchelder, Cambridge, Massachusetts.

Claim—An inkstand having a central dipping cup with an exterior screw, by which it is raised and depressed, causing a corresponding rise and fall of the ink in the stand as the plunger enters and leaves it—the combined screw, dipping cup, and plunger, being made in one piece.

208. MILL-STONE DRESS; Franklin Bellinger, Lockport, New York.

Claim—The furrows, cut into the stones tangentially with the eye, and gradually diminishing both in depth and width from the eye to the periphery, where they terminate in points, the space between the circle and eye of the runner being inclined or made open.

209. RICE HULLERS; Horatio N. Black, Philadelphia, Pennsylvania.

Claim—The employment of an elastic covering for forming one of the rubbers of a huller, composed of alternate layers of cloth and vulcanized rubber, the outer surface of which is formed by incorporating with the vulcanized rubber, emery, or other hard and gritty material, when the same is combined with an adjacent rubber of metal, or other hard unyielding material, with a grinding or breaking surface.

210. FURNITURE CASTERS; Henry D. Blake, New Hartford Centre, Connecticut.

Claim—The arrangement of the several parts of the caster.

211. APPARATUS FOR BEATING EGGS, CHURNING, AND THE LIKE PROCESSES; Wm. Borrman, Cincinnati, Ohio.

Claim—1st, The semispherical open work dasher, in combination with a bowl of corresponding form and size. 2d, In connexion with the above, the inverted cup, adapted to receive the egg or other matter as it becomes sufficiently beaten, and retain it beyond the reach of the dasher.

212. ATTACHING SHAFTS TO VEHICLES; John A. Boyce, Monroe, New York.

Claim—Attaching the shafts or poles to the axles of carriages, or other vehicles, by means of the combination of fastenings, viz: the bolt connexion and the projections on the pieces made to bear against the depressions in the double concave ring.

213. APPARATUS FOR EVAPORATING BRINE; Dennis Brigham, City of New York.

Claim—The arrangement of the steam heaters, with the boiler, pans, and cistern, so that the pans and cistern may be heated by one steam pipe.

214. MOWING MACHINES; Thomas D. Burrall, Geneva, New York.

Claim—The auxiliary frame and caster wheel, forming a carriage to which the animals are attached by a loose pole, when combined with the sector, lever, and standard, whereby the forward part of the main frame and the cutter bar are elevated or depressed on a line between the caster wheel and main wheel.

215. MACHINE FOR CUTTING SCREWS; Philip Chapin, Baltimore, Maryland.

Claim—1st, The employment of a cutter carriage with two branches, one of which is movable, and so constructed, mounted, and arranged as to embrace the prepared material and the driving screw at the same time and by the same movement. 2d, The combination of the carriage, the driving screw and the adjustable gear, for the purpose of cutting threads in wooden screws. 3d, The employment of the hollow binders, for the purpose of securing cutters in proper positions for the forming of wooden screws.

216. TURNING DOWN THE EDGES OF ELASTIC CLOTH; Gilbert H. Chesbro', Stafford, Connecticut.

Claim—The plate, constructed and operating for the purpose of turning the edges of the faced side of the cloth over as it passes between the compressing cylinders.

217. STRAW AND STALK CUTTERS; Peter S. Clinger and Cyrus Cremer, Conestoga Centre, Pennsylvania.

Claim—The revolving toothed cylinder armed with knives and spikes, in combination with the stationary knives and toothed concave, constructed to operate conjointly.

218. CARD PRINTING PRESS; Wm. W. Clarkson, Baltimore, Maryland.

Claim—1st, The combination by the peculiar arrangement of mechanism of the slide, which feeds the cards singly from the card-box; the bed-plate which supports and carries the impression form, and the inking roller which inks said form. 2d, The combination of the vibrating slide, which feeds the cards singly, with the groove guide, which receives, and retains, the cards below the platen and directly above the impression form while being printed. 3d, The peculiar manner of adapting the card-box for cards of different widths, lengths, and thicknesses, to wit: by having its side, front, and back boards or strips adjustable laterally, perpendicularly, and longitudinally, by means of slots and set-screws.

219. FROGS FOR RAILROAD CROSSINGS; Eli T. Conner, Borough of East Mauch Chunk, Pennsylvania.

Claim—1st, The construction of a frog, with a central part raised above and projecting over the bar, and also the ledges, in combination with the frog, for the purpose of securing to the frog, and making use of, in combination with the frog, any ordinary rail used upon railroads. 2d, The wedge and dove-tail-shaped cavity in the central part, in combination for the purpose of securing the point. 3d, The cavities or depressions, and in the base, in combination as aforesaid. 4th, The wedge and dove-tail-shaped point, to fill the cavity in the central part, so constructed that the same can be removed for repairs and renewals.

220. BREECH-LOADING FIRE ARM; Calvin Cox, Coxville, North Carolina.

Claim—The arrangement of a blade or cutter in the rear part of the breech of the fire arm, for use in combination with a bored sliding cartridge carrier and cartridge magazine.

221. RAT TRAP; Wm. H. Cox, Virden, Illinois.

Claim—The sliding case placed on the bed-piece, which is provided with end pieces and partitions, the case being operated by means of the spring, shaft, cross-arm, and arbor, connected with proper triggers.

222. MACHINE FOR MAKING WASHERS; Richard H. Cole, St. Louis, Missouri.

Claim—The loose bottom and the spring in connexion with the die.

223. Looms; George Crompton, Worcester, Massachusetts.

Claim—The employment of the two bars for holding up and holding down such of the series of jacks as are not required to be elevated or depressed at the forming of any shed, in combination with the jacks, the pattern cylinder or chain, and the lifter and depresser. Also, the holder bar, which acts on the ends of the heddle levers to hold them in their elevated or depressed position, until the beginning of the operation of opening a shed, in combination with the two bars for holding up and holding down such of the jacks as are not required to be shifted during the operation of opening a new shed.

224. Blowing Apparatus; David Cumming, Sorrel Horse, Pennsylvania.

Claim—1st, The bellows, in combination with exhaling bellows or receiver, when the former and latter are compressed by springs or weights of different capacities, in proportion to the exits of the said bellows, for the purpose of producing an uniform blast. 2d, The arrangement of the bellows, on the base, with the channel, valve, orifice, valve, and exit.

225. Joint for Spectacle Frames; George N. Cummings, Hartford, Connecticut.

Claim—The double conical shaped tube joint to spectacles.

226. Apparatus for Manufacturing Sulphuret of Carbon; Edouard Deiss, Paris, France; patented in France, November 13, 1855.

Claim—1st, The placing of the retorts over the principal flue, in order to obtain an intense heat at the base of the retorts. 2d, The earthen retorts, in combination with the crucibles or pots placed either within or outside the retorts. 3d, The grate for supporting the charcoal and tube, or its equivalent, for feeding in the sulphur, in combination with the crucible or retort for forming a chamber.

227. Processes for Extracting Fatty Matters; Edouard Deiss, Paris, France; patented in France, November 13, 1855.

Claim—The extraction of oils, grease, fats, and resins from wool, cloth, bones, oleaginous seeds, refuse, and other substances containing the same, whether naturally or artificially impregnated, by passing through them mechanically sulphuret of carbon.

228. Cotton Seed Planters; I. T. Donovan and W. J. Fowler, Sequin, Texas.

Claim—The combination of notched wheel, shaft, arms, and depending brushes thereof, with the circular hopper.

229. Harvesters; R. Dutton, Dayton, Ohio.

Claim—The employment of the loose hollow sliding sleeve, the hub of the driving-wheel, and the short axle, in combination with the slotted segment on the side of the platform, and the adjustable axle, when the slotted segment is provided on one of its inner sides with the cogs, and the axle with pinion on its inner and screw thread, and adjusting jamb nuts on its outer end.

230. Cotton Gins; John Du Bois, Greensboro', Alabama.

Claim—The use of the flanch on the face of the rib, that is to say, the flanch situated opposite the lower edge of the hopper board, with the lever end extending below that point, to separate the ginned seed from the cotton, and facilitate their passage from the roll-box.

231. Hatchet; N. F. English, Hartland, Vermont.

Claim—Forming the claw at the outer edge of the hatchet and over the eye or end of the handle.

232. Tuyere; George W. Finch, Gibraltar, Wisconsin.

Claim—The use of the two hollow cylinders, in combination with the slotted opening and the outlets, or more if necessary of varying form and size.

233. Cabbage Cutter; Adam Fischer, Dayton, Ohio.

Claim—The cabbage cutter, when all its parts are constructed and arranged for united operation.

234. Ruler; Thomas Fisher, Camden, New Jersey.

Claim—The application to rulers of india rubber, which will prevent the ruler from slipping, using for that purpose the aforesaid india rubber, or any other article substantially the same, and which will produce the intended effect.

235. Pencil Sharpener; Walter K. Foster, Bangor, Maine.

Claim—An improved article of manufacture, or a pencil sharpener, that is, of a steel or cutting blade and a cast metal body, cast or founded on the said blade, so as not only to confine it in its proper place with respect to the conical cavity of the body or holder, but so that the metal of the body or holder shall embrace opposite sides and the back of the blade, and terminate at or near the cutting edge of the blade by a surface made to stand at a right angle, or thereabouts, to the outer surface of the knife, the same, when the instrument is in use, serving not only to support the knife under pressure against its inner surface and cutting edge, but also to turn a chip or shaving, so as to enable the sharpener to operate to great advantage on the lead and wood of the pencil, particularly when the wood is cross-grained.

236. Buffer Heads for Railroad Couplings; M. C. Gardner, Rochester, New York.

Claim—The peculiar shape of the wrought iron bar and cast iron blocks, whereby the whole may be easily and firmly united by means of the band.

237. Liquids for Gas Metres; H. P. Gengembre, Rock Island, Illinois.

Claim—The use of an aqueous solution of deliquescent, metallic, and earthy salt or salts in gas metres, and the suspension in the upper stratas of the liquid of a base or carbonate of the base of the salt or salts employed.

238. Roofing Tiles; John F. Grassle, Hamilton, Ohio.

Claim—The groove in the outer tongue, the perforated flanch, shallow groove, and flanch of recess, in combination with the pin and lap of the adjacent tile. Also, the combination of the double grooves in the lap, tongues, flanches, recess, and shallow groove.

239. Pump Coupling; S. H. Gray, Bridgeport, Connecticut.

Claim—The curved or bow-shaped bar fitted underneath the lugs or projections on the base, and bearing on the flanch of the cylinder, the bar being adjusted by a thumb-screw.

240. Raking Attachment for Harvesters; George V. Griffith, Sandusky, Ohio.

Claim—The rotating rake and the reciprocating rake, combined and arranged to operate conjointly.

Also, the particular manner of operating respectively the rakes, through the medium of the grooves or guides, gearing which connect the two shafts, and the crank on shaft.

241. CHURN; T. B. Harper, Xenia, Ohio.

Claim—The combination of the pinion disk and pin, and operating in relation to the winch and dashers.

242. LOCK FOR DOORS; James J. Hamilton, New Castle, Indiana.

Claim—1st, The slides. 2d, The double lift.

243. COMBINATION COOKING RANGE AND GAS GENERATOR; A. Hendricks, Morrisania, New York.

Claim—The arrangement embracing a cooking range which has two fire chambers, two draft flues, and appropriate dampers, when used in connexion with a gas retort opening on the outside of the room.

244. PEN CLEARER AND HOLDER; Thomas S. Hudson, Boston, Massachusetts.

Claim—Forming the inside of the stand with a tapering or beveled shaped neck, through which a bunch of bristles is drawn, whereby, when the bristles are fastened at their lower ends with cement or glue, they are so rigidly held as to prevent their being drawn out or displaced. Also, the use of a hollow stand, the lower portion or base of which is fitted with plaster of Paris, or other non-conductor of heat, whereby the cement or pitch in which the bottom of the bristles is embedded is protected, and prevented from being softened or melted by heat.

245. COTTON HARVESTERS; Miles Hosford and J. C. Avery, Macon, Mississippi.

Claim—Operating the endless chain of pickers through the medium of the pulley, spring, wheel, ratchets with pawls, and the gearing, or any equivalent device, whereby a reserve power is obtained as the implement is moved from boll to boll, so that the cotton may be picked or gathered therefrom as the implement is adjusted to the bolls.

246. CORN HARVESTERS; Adam Humberger, Somerset, Ohio.

Claim—The corn carrier and shocker provided with pulleys, interlocking at pleasure with wheels in connexion with the rope, said pulleys being operated by lever and rods for binding and shocking corn.

247. STEAM WARMING APPARATUS; E. T. Ingalls and J. R. Nichols, Haverhill, Massachusetts.

Claim—1st, The device for increasing or diminishing the capacity of the fire chamber, so as to maintain a larger or smaller amount of fuel in a state of combustion. 2d, A vessel, in connexion with flexible pipe and spring, operating together for controlling a valve or valves affixed to boilers for regulating steam pressure. 3d, The device for supplying water to the boiler. 4th, In the construction of fluted or corrugated radiators of thin plates of iron, placing across the corrugations strips of metal securely fastened.

248. HOSE SUPPORTERS; Asa Johnson, Cairo, New York.

Claim—The hose supporter, or its equivalent, for the purpose of supporting the hose and giving form to the limb.

249. ELLIPTIC CUSHION FOR RAILROAD CARS; Samuel R. Jones, York, Pennsylvania.

Claim—1st, The local relation and mode of application of the semi-elliptic buffer. 2d, The combination and arrangement of the elliptic cushion.

250. FIELD-FENCE; Ebenezer E. Lewis, Geneva, New York.

Claim—The combination of the panels and posts of a fence, when arranged independently of each other.

251. LIFE AND TREASURE BUOY; Francis D. Lee, Charleston, South Carolina.

Claim—The arrangement of the escape valves, rods, chain, windlass, and the air valve and screw on the windlass shaft.

252. BREECH-LOADING FIRE ARM; Thomas Lee, City of New York.

Claim—1st, The breech-piece on its centre pin, in combination with the lever, blocking piece, and cam-shaped end. 2d, The manner of delivering the detonating pillets and shutting off fire from the same, by the use of the inclined ended rods and shield.

253. CORN PLANTERS; Oliver Lippincott, Camden, New Jersey.

Claim—The arrangement of the plough and its beam with frame and its hopper, weight, slide, wheel, and covering share.

254. TOY; Conrad Liebrich, Philadelphia, Pennsylvania.

Claim—Arranging certain numbers, letters, words, or other signs upon two, three, or more disks, and combining them with certain devices for setting the disks in motion, and stopping them in such a way that after each stoppage the relative position of the disks shall be changed, so as to show a different relative position of those numbers, letters, words, or other signs, upon the circumference of the disks, and arranging the whole in such a manner that the nature of the change in the relative position of the disks after each stoppage will be a matter of accident.

255. SPIKE MACHINE; Michael Loughran, Pittsburgh, Pennsylvania.

Claim—The employment of dies working on separate shafts and forming spikes at a single revolution.

256. PROTECTING GILDING ON GLASS; Peter V. Mathews, Philadelphia, Pennsylvania.

Claim—The use of the tin-foil, or other thinly laminated or rolled metal, as a backing for the gilded letters, figures, &c., which are generally required on the inner surfaces of the panes of glass of windows, transoms, and doors of stores, offices, hotels, &c., for the purpose of securing and protecting the said letters, figures, &c., from being damaged, and without obstructing the free passage of the rays of light through the immediately surrounding parts of the glass from either side of the same.

257. MACHINES FOR MAKING HORSE SHOES; John McCarty, Philadelphia, Pennsylvania.

Claim—1st, The combination of the mandrel with the rollers, when the said mandrel is of the same form as that presented by the inner edge of the shoe to be manufactured, when it is so operated as to convey the bent bar to dies, there retain it while it is submitted to the action of the said dies, and subsequently withdraw the formed shoe from the same, and when the rollers are caused to approach each other as the mandrel advances. 2d, The jaws, the reciprocating mandrel, with its projection underneath the lower die, with its recess for receiving the projection of the mandrel, and with its projecting lip and the upper die, when the said dies, mandrel, and jaws are arranged to close and lap over each other, and when they are otherwise arranged and actuated. 3d, Piercing the requisite nail holes in the shoe by means of the punches, when the same are attached to the plates, when the latter are hinged to the guide blocks, and when the upward movement of the latter is regulated by the adjustable wedges.

ABSTRACTS OF SPECIFICATIONS OF RECENT PATENTS.

FROM H. HOWSON'S PATENT AGENCY, PHILADELPHIA.

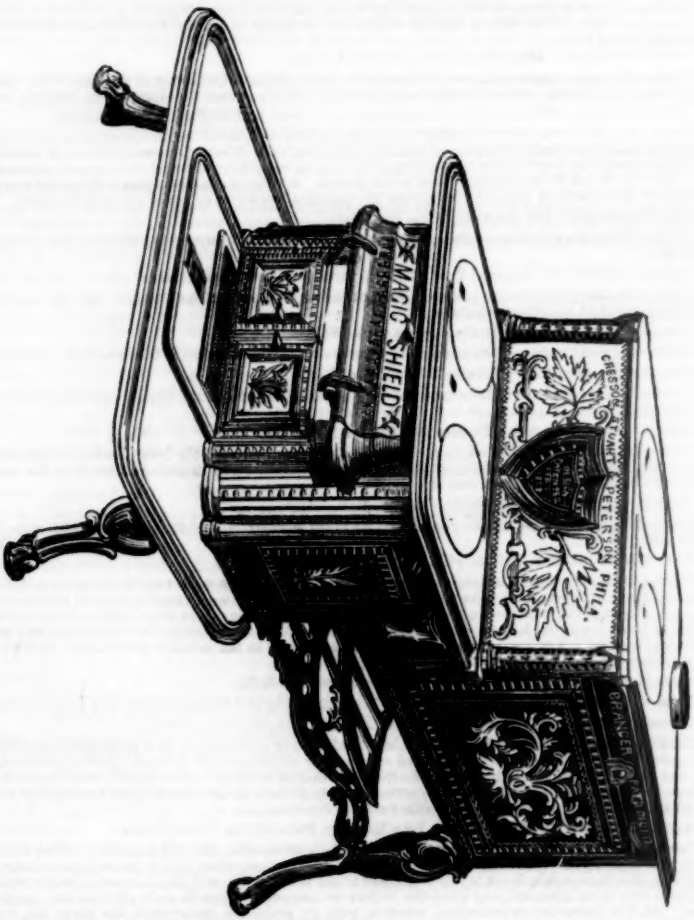
For the Journal of the Franklin Institute.

R. D. Granger's Improved Cooking Stove.

Patent granted December 1st, 1857.

This invention, which is an improvement on that for which a patent was granted to R. D. Granger, on the 21st of March, 1848, consists in forming underneath the oven a chamber, through which a current

Fig. 1.



of cold air, entering at the rear of the stove, may pass into a space between the back of the fire-place and front of the oven, and from thence either into the interior of the latter, or into the external atmo-

sphere, the cold air chamber serving the purpose of dividing the flue, for the passage of the products of combustion under the oven to the chimney.

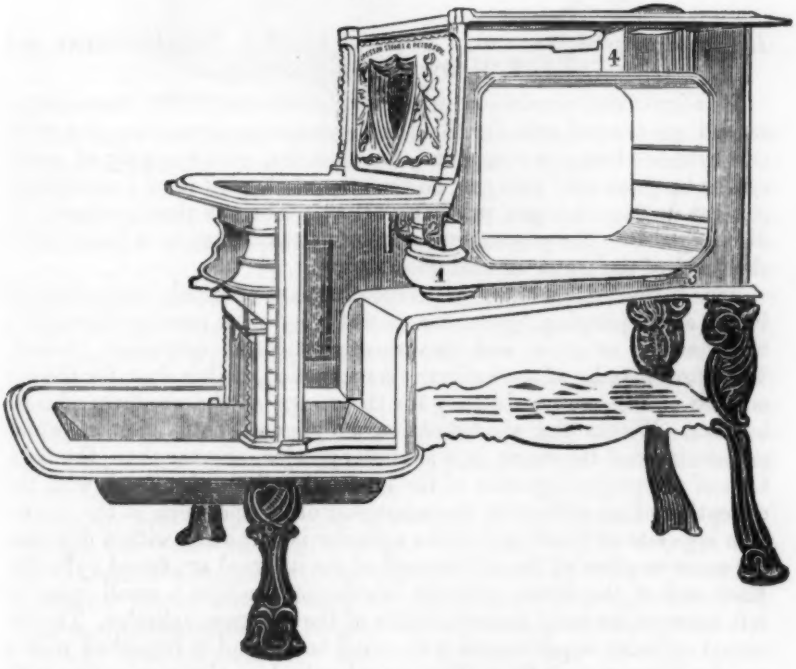
The object of this arrangement is to counteract the excessive heat on the bottom of the oven, and, at the same time, to divide and disperse the products of combustion underneath the same.

Fig. 1 Is a perspective view of the improved cooking stove.

Fig. 2 Perspective view of the same with one side removed, so as to show the interior arrangements.

The exterior form of the stove differs but little from that of ordinary cooking stoves. Above the oven is the usual passage, forming a communication between the fire-place and the chimney, with which a lower passage, divided in the centre by the air-flue 1, (Fig. 2,) also communicates. At one end of this air flue is situated the orifice 3, and, at the other end, the vertical flues 2, which communicate through orifices in the side plates of the stove, with the external atmosphere, and also with the interior of the oven through any convenient number of openings.

Fig. 2.



By means of these flues, a constant current of air is continually passing underneath the oven, and, as it enters in a cool state into the horizontal flue 1, through the orifice 3, it absorbs a portion of the intense heat to which the bottom of the oven is subjected, and, rising through the flues 2, either enters the oven, or passes out through the side orifices into the external atmosphere. An ordinary damper is

situated at the top of the oven for retaining the heat within, or allowing it to escape from the same.

By means of a valve 4, the amount of the products of combustion passing above and below the oven may be regulated at pleasure. A hollow wedge-formed division is situated at the point where the products of combustion pass from the fire-place to the passage above the oven, in order that the heat before entering the chimney, may be dispensed and caused to pass beneath the openings, above which are situated the cooking utensils.

When the valve 4 is in such a position as to cause the products of combustion to pass underneath the oven and upwards, at the back of the same to the chimney, an undue amount of heat would be imparted to the bottom plate of the oven, were it not for the horizontal flue 1, along which passes a constant supply of cool air, which counteracts this excess of heat. At the same time this cool air absorbs a sufficient quantity of heat to cause it to rise through the flues 2 into the oven, or out of the side orifices into the external atmosphere.

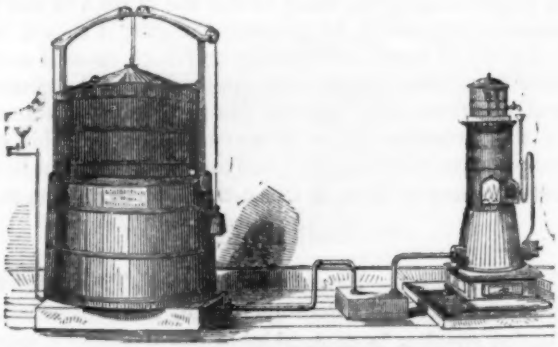
Manufactured by Messrs. Cresson, Stuart & Peterson, of this City.

Improved Gas Apparatus. Patented by D. L. Weatherhead and J. T. Henry, April 6th, 1857.

This invention consists in generating gas in a cylinder containing a second perforated cylinder filled with broken pumice stone, the exterior cylinder being in constant communication with a supply of material to be generated into gas, so that the whole may form a continuous gas generating and gas purifying retort. The gas thus generated is discharged into the gasometer in minute jets or films, at a point below the level of the water in said gasometer.

This invention, an exterior perspective view of which is represented in the accompanying figure, consists of a cylinder passing through a fire chamber or stove, and also through the fuel contained therein. This stove may be of the ordinary construction, with a door for the admission of fuel, and a chimney for the escape of the products of combustion. Within the abovementioned cylinder, both ends of which project beyond the stove, is a second cylinder, shorter than the first. One of the projecting ends of the external cylinder is closed, with the exception of an orifice for the admission of a pipe, seen in the figure. The opposite or front end of the cylinder is furnished with a detachable cover to allow of the withdrawal of the internal or second cylinder. Each end of the latter cylinder is enlarged, so that a small space is left between its body and the inside of the external cylinder. The internal cylinder is perforated with small holes, and is furnished with a rod for extracting it from the external cylinder. Communicating with the front of the latter, is a syphon-formed pipe, furnished at the top with a funnel-shaped mouth. A vessel for containing oil or fatty matter is attached to the chimney, so that the heat from the same may maintain the contents of the vessel in a fluid condition, and be conveyed to the outer end of the external cylinder, through the syphon-

formed tube abovementioned. From the orifice in the other end of the cylinder passes a pipe communicating with the well of the gasometer, through which it passes upwards into the gas chamber above the level of the water, where it is so bent that the bent end may terminate some distance below the water level. The extreme end of the pipe is enlarged, and the lower portion of this enlargement is perforated with small holes or narrow slits; or the end of the pipe may be formed in any other manner, by which the gas may be allowed to escape into the water in minute jets or thin films.



The inner perforated cylinder having been filled with pumice stone broken into pieces about the size of a walnut, is placed within the external cylinder, the cover put on the end, and the fuel in the fire chamber ignited. The oil or fatty matter is allowed to drop into the funnel-mouth of the syphon-formed pipe, which conveys it to the projecting end of the external cylinder. Here the gas is generated in an impure state, and from thence it passes through the interstices formed by the broken pieces of pumice stone in the inner perforated cylinder, and thence in a pure state to the gasometer.

After repeated experiments with the different materials, pumice stone has been found to answer best for the desired purpose, as it is indestructible as regards the action of the fire, and of such a porous nature as to absorb all the moisture of the gas, and to assist in the extraction of the tar from the same.

This tar passes through the interstices of the broken pieces, and through the perforations of the inner cylinder, and is brought into contact with the heated exterior cylinder, where all the useless refuse portions of the tar are consumed, the gas passing off through the pumice stone and perforations to the pipe communicating with the gasometer.

It will thus be seen that the outer cylinder and inner perforated cylinder, with its pumice stone, form, when combined, a purifying gas retort, and that the usual and cumbrous purifying apparatus is dispensed with.

The gas having left the retort, passes in a purified but heated state to the gasometer, and is discharged into the same, through the perforated end of the pipe, at a point below the level of the water in the

chamber of the gasometer. It then rises above the level of the water, and being cooled by contact with the latter, passes through the distributing pipe to the burners.

One great advantage of this peculiar manner of discharging the gas into the gasometer is, that no explosion of the gas contained therein can take place, for, even should the fire ignite the gas in the retort through the wearing away of the latter, the flame, after passing through the communicating pipe, would be extinguished by the water before it could reach the gas in the chamber.

Although allusion has been made to the use of oil and fatty matter as the substances from which to generate the gas; it should be understood, that the above mentioned purifying retort, as well as the cooling and safety apparatus, are equally applicable to the generation of pure and cool gas from other known gas-producing substances. The main aim of the inventors has been to construct a portable gas apparatus at a comparatively trifling cost, and one occupying but little space.

Manufactured and erected by Henry & Campbell, No. 24, South Fifth St., Philada.

Improved Water Closet. Patent granted to J. T. HENRY & W. P. CAMPBELL, December 29th, 1857.

This invention consists in so combining the basin of a water closet with a valved chamber, cistern, and communicating pipes, that the soil may be readily and effectually disposed of and all offensive smell obviated.

Fig. 1 is a perspective view of the improved water closet with the lid raised.

Fig. 2 is a sectional view of the same.

A A A, (Fig. 2,) represents the bottom and sides of an oblong box, which contains the basin C, valve chamber D, and cistern E. The cover B of the box has the usual opening *a*, and the ordinary hinged lid *b*. The basin C has a curved pipe communicating with the valved chamber D. In the latter is a conical valve *d*, arranged so as (when depressed) to stop the communication between the chamber D and the exit pipe.

Attached to the valve *d* is a spindle *f*, guided by a cross-bar *h*, in the pipe *g*, which terminates at an opening *i* in the cover B, the spindle *f*, being furnished at the top with a handle *j*, by means of which, the valve *d* may be lifted at pleasure. A pipe F, forms a communication between the cistern E and the curved pipe *c* of the basin C.

The cistern is maintained nearly full of water at an uniform level, by means of the usual ball-cock, or other convenient apparatus, connected with the water pipe, and the cistern is so situated, that the water therein shall be level with that in the basin C and pipe *g*.

The soil in the basin C is carried off by raising the valve *d* above the opening from the pipe *e*, into the chamber D, when the water and soil rush into the latter, and thence through the exit pipe *e*, an impetus being given to this discharge of the water and soil, by the rush of water from the cistern E through the pipe F into the curved pipe C of the

cistern. The valve *d* is then closed, when the water assumes its former level, as shown in Fig. 2. By the peculiar construction of the valved chamber D, and its position, as regards the opening of the pipe C into the same, it will be seen that the valve *d* may be raised sufficiently

Fig. 1.

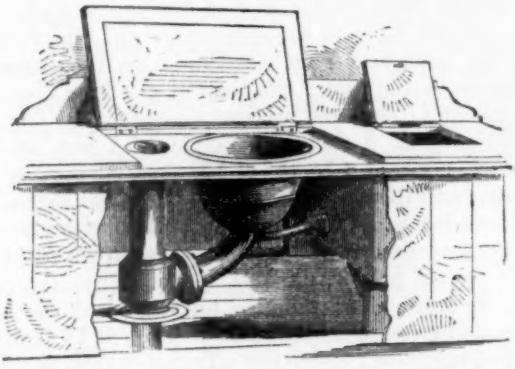


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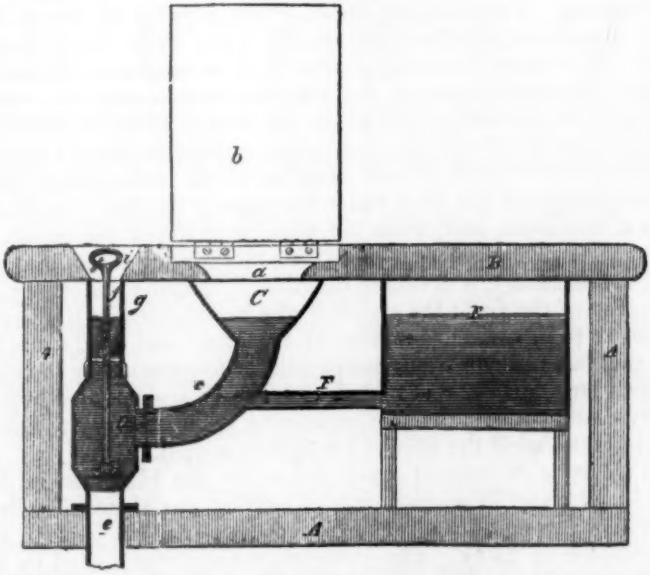
Fig. 2.



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Manufactured and erected by the patentees, No. 24 South Fifth Street, Philadelphia.

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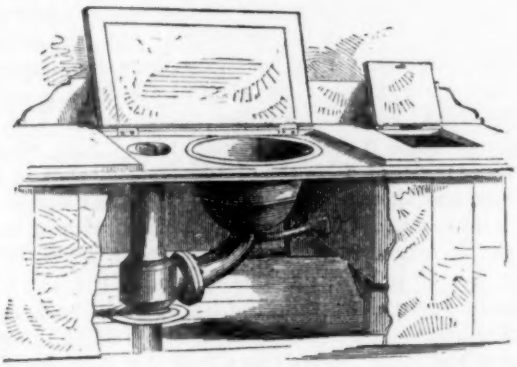

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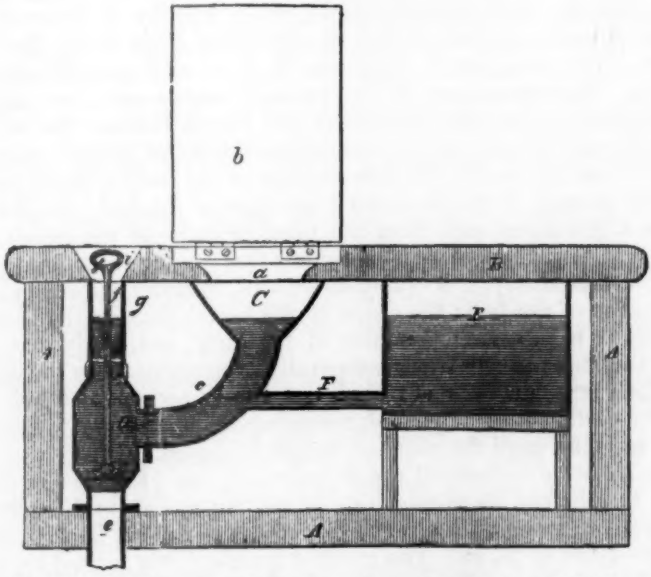

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MECHANICS, PHYSICS, AND CHEMISTRY.

For the Journal of the Franklin Institute.

Description and some Account of the Working of Mackenzie's Cupola.

Messrs. I. P. Morris & Co. have lately put in use at their Port Richmond Iron Works, Philadelphia, two of Mackenzie's patented cupolas in the place of two built in the old style; and, the following statement shows the important gain resulting from the improved cupola, which may be described thus: the shell at the base is oval, having a major diameter of 11 feet, and a minor diameter of 5 feet, and retains these dimensions until it reaches a height of 7 feet, when the major diameter reduces until, at a height of 16½ feet, it becomes equal to the minor diameter, and the shell assumes a cylindrical shape. The hearth is also oval, and is 9½ feet long by 4 feet wide, with an inclination of 3 inches in the direction of its length in order to drain the metal. The lining of the hearth proper, rises 9½ inches at the tap hole, and 6½ inches at the opposite side; thus the top edge is horizontal. Above this, and extending completely around, a space of 1½ inches is left for the entrance of the blast; above this a funnel-shaped flanch rises about 3 feet, until its expanded upper edge reaches the shell to which it is riveted, the lower part being stayed to the shell. This serves as a blast chamber, and also as a support for the charge: around its lower edge an angle iron is riveted, and upon it the lower course of the lining rests, the inner edges of the bricks projecting two inches beyond the lining of the hearth. Two charging doors, 3 feet high by 4½ feet wide, are placed opposite each other upon the flat sides, about 8 feet above the hearth. The other details are similar to those used upon the old style cupolas. The advantages of the patented cupola are: the tapering shape given to the lining just above the hearth sustains the superincumbent mass of the charge, and causes a space or partial space, between it and the hearth for the reception of the melted metal, and for the free passage of the blast under the mass of the fuel; the blast enters in a thin sheet, and, from the peculiar shape of the cupola, does not move over 2 feet before it encounters that coming from the opposite parts; consequently, it is evenly distributed, insuring uniformity in the combustion of the fuel; the shape of the hearth permits the charging with entire pigs, saving the labor of breaking; and, lastly, the space below the blast passage being comparatively unoccupied by the charge, permits a large quantity of molten metal to be accumulated in it when a heavy casting is to be poured, rendering it unnecessary to store the metal in ladles until the required weight is melted.

The old style cylindrical cupola taken out was 44 inches in diameter at hearth; and its average rate of melting was about 5000 lbs. per hour with a consumption of 900 lbs. of coal, or about 5½ to 1, and a blast pressure of 24 oz. The greatest quantity ever melted by it was 8000 lbs. per hour. The average result of the Mackenzie cupola is 20,000 lbs. per hour, consuming 2500 lbs. of coal, or 8 to 1; and a blast pressure of 6 oz. Best result 24,000 lbs. per hour. This cupola will contain 38,000 lbs. of iron at a charge, and with a supply of 3600

cubic feet of air per minute, at the above pressure, will run a continuous stream of hot metal. The mode of charging is this: to bed with 2500 lbs. of coal, upon this 10,000 lbs. of whole pigs, then 800 lbs. of coal, again 10,000 lbs. of pigs, then 800 lbs. coal, and so on until 25 tons are charged.

The working of this cupola was deemed so satisfactory, that Messrs. I. P. Morris & Co. determined to put in a second one of a smaller capacity for moderate heats: accordingly, a 44-inch cylindrical cupola was altered to Mackenzie's arrangement, retaining above the tuyere about the same capacity, but below it, the capacity was reduced one-fifth.

The operation of this cupola, before and after the change, proved conclusively the economy resulting from it, and will be seen from the following statement of thirteen ordinary heats:

OLD STYLE CUPOLA.			MACKENZIE'S CUPOLA.		
Metal.	Coal.	Time.	Metal.	Coal.	Time.
lbs.	lbs.	h. min.	lbs.	lbs.	h. min.
12,000	2200	2 30	12,000	1700	2 05
17,000	3500	3 20	17,000	2000	2 30
16,500	3200	3 00	16,500	1900	2 37
10,500	2000	2 15	10,500	1400	1 49
12,000	2250	2 30	12,000	1600	1 47
11,000	2160	2 30	11,000	1600	1 57
17,000	3700	3 35	17,000	2000	2 30
12,000	2100	2 25	12,000	1700	1 55
11,500	2100	2 20	11,500	1600	1 55
15,000	2700	2 50	15,000	1600	2 20
10,300	1950	2 00	10,300	1500	1 43
13,300	2140	2 25	13,300	1800	2 00
10,500	1950	2 10	10,500	1500	1 40
*168,600	31,950	33 50	168,600	21,900	26 48

Thus it will be seen that in melting the same quantity of metal, there was a

Saving of coal, 31,950 lbs.—21,900 lbs. = 10,050 lbs.
" time, 33 h. 50 m.—26 h. 48 m.= 7 h. 02 m.

The duration of the heats in each case, was counted from the time of putting in the blast until the hearth was dropped.

The pressure of blast in old style cupola was 22 oz.; ditto in Mackenzie's 11 oz.

Four hands were required to work the old style cupola, while three will suffice for Mackenzie's; and the proportion of coal to iron melted is in the one case, 1 to 5·28, and in the other, 1 to 7·74.

The new cupola is charged in this way: first, a bed of 1200 lbs. of coal, then 5000 lbs. of metal, next 200 lbs. of coal, then 3000 lbs. of metal, again 200 lbs. of coal, and so on until 16 or 18,000 lbs. of metal are charged. The charging is made in about one hour after lighting up, and usually, the metal runs in from eight to ten minutes after the blast is put in. W. J.

*The amounts of metal melted in the Mackenzie cupola should not be taken as the best effect, as it has not yet been urged with a full charge of metal for a heavy casting, but it is expected to give 14,500 lbs. per hour when required.

For the Journal of the Franklin Institute.

Particulars of the Steamer Japanese.

Hull built by Wm. Webb. Machinery by Novelty Iron Works, New York. Built for the Russian Government.

HULL.—

Length on deck,		214 feet.	
" at load line,		212 "	
Breadth of beam (molded),		36 "	
Depth of hold,		10 "	
" " to spar deck,		17 "	
Length of engine room,		20 "	
Draft of water,		12 "	6 inches.
Tonnage, { hull,	950.		
Tonnage, { engine room and bunkers,	350.		
Area of immersed section at load draft,	380 sq. ft.		
Contents of bunkers,	400 tons.		
Masts, three—rig, barque.			

ENGINES.—Horizontal oscillating.

Diameter of cylinder,		51 inches.
Length of stroke,	3 feet.	
Maximum pressure of steam,	25 lbs.	
Cut-off—1-6 to 2-4.		
Maximum revolutions at above pressure,	50.	
Weight of engines,	234,000 lbs.	

BOILERS.—Two—Return flued.

Length of boilers,	24 feet	6 inches.
Breadth "	12 "	9 "
Height " exclusive of steam chimney,	12 "	9 "
Weight of " with water,	138 tons.	
Number of furnaces,	10.	
Breadth "	3 "	
Length of grate bars,	6 "	9 "
Number of flues, above, 18—below, 15.		
Internal diameter of flues—above, 11 ins. and 13 ins.—below, 15 inches.		
Length of flues—above, 18 feet 9 ins.—below, 12 feet.		
Heating surface,	5728 sq. ft.	
Diameter of smoke pipe,	6 feet	3 inches.
Height " " (telescopic),	36 "	6 "

PROPELLERS.—

Diameter of screw,	11 feet.	
Pitch "	21 "	
Number of blades,	3.	

Remarks.—Frames, *molded*, 15 ins.—*sided*, 15 ins. 30 inches apart from centres, strapped with diagonal and double laid braces 4½ inches by ¾-inch. Depth of keel, 12 inches. Independent steam, fire, and bilge pump, one; bulkheads, two. C. H. H.

Analysis of Milk and Flour. By M. E. MONIER.

If into milk diluted with water and acidulated, a solution of cameleon-mineral is slowly dropped, the beautiful color of the mineral is seen to disappear. The study of the re-action shows that it is due to the caseine and albumen, and not to the butter or sugar.

Take 10 cubic centimetres (about ⅛ pint) of milk, and bring it to a temperature of from 113° to 122°. Prepare a liquor containing 2 %

cent. of albumen, and ascertain the volume of the solution of cameleon which is all necessary to produce a given tint in this liquid. Dilute and acidulate the milk with some acid which will not coagulate either the albumen or the caseine, and determine the quantity of the cameleon solution necessary to produce in it the same tint which has been produced in the standard liquor. A simple proportion will then give the quantity of albumen and caseine contained in the milk.

Take another equal quantity of the milk at the same temperature as before, and by a drop of acetic acid coagulate the caseine, which will carry the butter with it. Filter the whey, wash it well, acidulate it, and determine the quantity of cameleon necessary to produce the standard tint in it. Equal weights of caseine and albumen decompose equal volumes of the solution of cameleon. Hence, by subtracting the weight of the albumen from that at first determined, the weight of the caseine will be found. The butter may then be found by subtracting the weight of the caseine from that of the dried curd, (or if greater accuracy is required, it may, of course, be extracted by ether.)

The mode of analyzing flour rests upon these principles:—

1st. That the azotized principles are totally soluble in dilute hydrochloric acid.

2d. That the solution of cameleon is decomposed by these azotized matters.

3d. That the non-azotized matters, (starch, dextrine, &c.,) have no action on it.

M. Monier uses a standard flour which has been carefully analyzed and kept in close stoppered bottles from air and moisture. 0·3 grms. (4½ grains,) of this flour is put into a mattrass and boiled for a few moments with diluted hydrochloric acid. The same is done with an equal quantity of the flour to be tested; the liquids are added to equal quantities of the solution of cameleon until the same tint is obtained, and as the azotized matter of the standard flour is known, that of the sample is obtained by simple proportion.

The non-azotized principles are determined by thoroughly drying the flour and subtracting from its weight that of the azotized matters.

Legumine re-acts upon the cameleon like albumen, whilst the vegetable alkalies, milk, &c., have no action.—*Comptes Rendus de l'Academie des Seiences de Paris.*

For the Journal of the Franklin Institute.

Alger's New Form of Blast Furnace.

Charles C. Alger, of the State of New York, has devised a novel form of blast furnace from which he expects important results.

Mr. Alger is a practical iron-master of twenty years' experience, whose observation upon hard coal furnaces, seems to have led him to the fact that anthracite furnaces as now blown with a pressure not over five pounds to the inch, cannot be advantageously built with a larger crucible than 6 feet diameter at the "*tuyere line.*"

To reduce larger quantities of ore with the same fuel, and a pressure limited within five pounds per inch, Mr. Alger has conceived a change in the horizontal section of the crucible, the bosh, and the stack.

All his horizontal sections are ellipses of greater or less eccentricity. His crucible at the "*tuyere line*" being a much elongated ellipse, approximating a narrow parallelogram in its horizontal section, which, at the "*bosh*," becomes an ellipse with axes of 18 and 7, and at the top of the stack, of 14 and 5.

He proposes to blow his new form of furnace by numerous "*tuyeres*" along the larger side of the crucible, (sometimes six on each side,) while at the narrow ends of the crucible are two dam stones of the usual arrangement, so as to admit of working, and drawing at both ends of the elongated hearth. With this elliptical furnace, and the introduction of the blast at many points, (on the longer side of the *hearth*) so as to act efficaciously upon the narrow diameter of the crucible, he expects to effect a much larger reduction of ore with the improved stack, and at considerably less expense in every particular.

We take pleasure in recommending Mr. Alger's proposition to our readers as promising results of some consequence to the manufacture of pig iron.

Mode of Detecting Decay in Timber.

The *Cosmos* reports from other journals, a simple mode said to have been adopted from immemorial times in the ship-yards of Venice for ascertaining the fitness of timber for their constructions. "A person applies his ear to the middle of one of the ends of the timber, while another strikes upon the opposite end. If the wood is sound and of good quality, the blow is very distinctly heard, however long the beam may be. If the wood were disaggregated by decay or otherwise, the sound would be for the most part destroyed."

For the Journal of the Franklin Institute.

Description of Paraselenes Observed on the 27th of April, 1858.

By James M'Clune.

The paraselenes or mock-moons which were visible on the 27th of April, 1858, merit at least a record, both on account of their distinctness and the rareness of the phenomenon. While halos are much more frequently observed around the moon than the sun, mock-moons are more seldom seen than mock-suns. I have observed a paraselene but once before in thirty years, and many others have not noticed the phenomenon in even a longer period. That paraselenes are visible at very distant intervals, except in high latitudes, in other countries as well as our own, is evident from the fact, that comparatively few observations of them are recorded.

The phenomenon of the 27th of April, was visible from half-past

seven o'clock, P. M., until half-past ten o'clock P. M. The thermometer at nine o'clock, P. M., stood at 40°, and the barometer at twenty-nine and seven-tenth inches. About three-fourths of the sky was overspread with light clouds.

At eight o'clock the phenomenon exhibited nearly all the usual attendants of parhelia, thus proving it to be due to like causes. Two very bright paraselenes appeared at the same height as the moon, one on the eastern and the other on the western edge of a halo, while a third paraselene, but more faint than the other two, was visible at the upper part of the halo directly between the moon and the zenith.

The halo, except at the inner edge where red predominated, was of a dark grey color.

At the same time bands, or rather cones of light, could be seen extending seven or eight degrees from the moon toward the paraselenes, forming an imperfect cross, of which the moon occupied the centre.

At half-past nine o'clock a second halo encircling the first, could easily be perceived, while the paraselenes of the same height as the moon, exhibited a cone of light extending from them in a horizontal direction on the side opposite the moon, giving to each of them the appearance of a huge comet. The paraselene at the apex of the halo was scarcely visible, and the cones of light extending from the moon could no longer be seen.

At ten o'clock the paraselene to the east of the moon was still visible; the one to the west could with difficulty be perceived, and the second halo had entirely disappeared, but the circumzenithal arc, which had not been visible before, was plainly, though not strongly defined.

The phenomenon, when first observed, was nearer the horizon than halos usually appear.

The last two months have been somewhat remarkable for atmospheric and other phenomena. The zodiacal light has been unusually brilliant, and the Aurora Borealis has appeared with a frequency and a beauty which are certainly remarkable in this latitude.

Peculiar conformations of clouds have also been noticed on several occasions. On the evening of the twentieth of March, clouds of only a few degrees in breadth were observed, extending in some instances from the horizon to the zenith, and presenting many of the protean forms of the Aurora Borealis. These had scarcely disappeared when ray-like clouds became visible in the south-west, radiating from a point at an elevation of about 40°, and these clouds, in turn, were quickly succeeded by others of an equally peculiar form in the south.

On the following week, four strata of clouds were noticed.

The question might be asked, have these peculiar atmospheric appearances any connexion with the absence of strong winds, and the long period of dull weather which immediately succeeded the greater part of them?

The increased brightness of the zodiacal light is probably owing to a difference in the state of our atmosphere, and not to any change in the self-luminous matter of that unexplained phenomenon.

*On the Phenomenon of Relief of the Image formed on the Ground Glass of the Camera Obscura.** By A. CLAUDET, Esq., F. R. S.

[Read before the Royal Society, June 18th, 1857.]

The author having observed that the image formed on the ground glass of the camera obscura appears as much in relief as the natural object when seen with the two eyes, has endeavored to discover the cause of that phenomenon, and his experiments and researches have disclosed the singular and unexpected fact, that although only one image *seems* depicted on the ground glass, still each eye perceives a different image; that in reality there exist on the ground glass two images, the one visible only to the right eye, and the other visible only to the left eye. That the image seen by the right eye is the representation of the object refracted by the left side of the lens, and the image seen by the left eye is the representation of the object refracted by the right side of the lens. Consequently these two images presenting two different perspectives, the result is a stereoscopic perception, as when we look through the stereoscope at two images of different perspectives.

It appears that all the different images refracted separately by every part of the lens, are each only visible on the line of their refraction when it corresponds with the optic axes, so that while we examine the image on the ground glass, if we move the head we lose the perception of all the rays which are not corresponding with the optic axes, and have only the perception of those which, according to the position of the eyes, gradually happen to coincide with the optic axes. Consequently when we look on the ground glass perfectly in the middle, the two eyes being equally distant from the centre, the right eye sees only the rays refracted from the left of the lens, and the left eye only those refracted from the right of the lens.

If we move the head horizontally, as soon as we have deviated about 6° from the centre on the right or on the left, in the first position the right eye sees no image, and the left eye sees the image which before was seen by the right eye; in the second position the inverse takes place, and of course in both cases there cannot exist any stereoscopic illusion.

When we examine on the ground glass the image of a solid produced by the whole aperture of the lens, if we have taken the focus on the nearest point of the solid, we remark, in looking with the two eyes, that the image is stereoscopic, and as soon as we shut one eye the illusion of relief disappears instantly.

The stereoscopic effect is beautifully brought out by the image of a group of trees; and when experimenting in an operating room, it is rendered quite conspicuous if we take the image of an object having several planes very distinct, such as the *focimeter*, which the author has described in a former memoir (see *Phil. Mag.* for June, 1851).

If without altering the focus we examine the same image with the pseudoscope, the effect is pseudoscopic. But if the focus has been set on the most distant plane of the focimeter, the effect is pseudoscopic, and it becomes stereoscopic in looking with the pseudoscope.

*From the Lond. Edin. and Dub. Phil. Mag., May, 1858.

The image loses its relief when it is produced only by the centre of the lens. The stereoscopic and pseudoscopic effects are therefore as much less apparent as the aperture of the lens has been more reduced, and they are the more evident if the image is produced by two apertures on both extremities of the horizontal diameter of the lens. This mode of conducting the experiments presents the most decided manifestation of the whole phenomenon.

But it must be remarked, that if the image is received on a transparent paper instead of ground glass, it does not in any case present the least illusion of relief. The surface of the paper has the property of preserving to both eyes the same intensity of image from whatever direction the rays are refracted on that surface, and at whatever angle the eyes recede from the centre to examine the image. In fact, all the various images refracted through every part of the lens and coinciding on the surface of the paper, are visible at whatever angle they are examined.

The reason of this difference between the effect of the ground glass and that of the paper is, that through the surface of the ground glass, composed of innumerable molecules of the *greatest transparency*, only deprived of their original parallelism by the operation of grinding, but acting as *lenses* or *prisms* disposed at all kinds of angles, the rays refracted by the various parts of the lens continue their course in straight lines in passing through these transparent molecules, and are visible only when they coincide with the optic axes, being invisible in all other directions; that, in short, they are not stopped by the surface of the ground glass; while the paper being perfectly opaque, stops all the rays on their passage, by which the image of the object remains fixed on the surface. Each molecule of the paper becoming luminous, sends new rays in all directions; and from whatever direction we look on the paper, we always perceive at once all the images superposed, so that each eye seeing the two perspectives mingled, the process of convergence according to the horizontal distances of the same points of the various planes, cannot have its play, and no stereoscopic effect can take place, as is the case with the ground glass, which presents to each eye an image of a different perspective.

The author explains that he has ascertained these facts by several experiments, the most decisive of which consists in placing before one of the marginal openings of the lens a blue glass, and a yellow glass before the other. The object of these colored glasses is to give on the ground glass two images, each of the color of the glass through which it is refracted.

The result is two images, superposed on the ground glass, one yellow and the other blue, forming only one image of a grey tint, being the mixture of yellow and blue, when we look with the two eyes at an equal distance from the centre. But when shutting alternately, now the right eye and then the left eye, in the first case the image appears yellow, and in the second it appears blue.

If while looking with the two eyes (the opening on the right of the lens being covered with the yellow glass, and the opening on the left

with the blue glass) we move the head on the right of about 6°, the mixture of the two colors disappears, and the image retains only the blue color; on the other hand, if after having resumed the middle position, which show again the mixture of the two colors, we move the head on the left of 6°, the mixture disappears again, and the image retains only the yellow color.

This proves evidently that each eye sees only the rays which, when after having been refracted by any part of the lens, and continuing their course in a direct line through the ground glass, coincide with the optic axes, while all the other rays are invisible.

The consideration of these singular facts has led the author to think that it would be possible to construct a new stereoscope, in which the two eyes looking at a single image could see it in perfect relief, such a single image being composed of two images, of different perspectives superposed, one visible only to the right eye and the other to the left. This would be easily done by refracting a stereoscopic slide on a ground glass, through two semi-lenses separated enough to make the right picture of the slide coincide with the left picture at the focus of the semi-lenses. The whole arrangement may be easily understood; we have only to suppose that we look through a ground glass placed before an ordinary stereoscope at the distance of the focus of its semi-lenses, the slide being strongly lighted, and the eye seeing no other light than that of the picture on the ground glass. The whole being nothing more than a camera having had its lens cut in two parts, and the two halves sufficiently separated to produce at the focus the coincidence of the two opposite sides of the stereoscopic slide placed before the camera.

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*Description of the Stereomonoscope.** Invented by A. CLAUDET, Esq., F. R. S.

[Read before the Royal Society, April 15, 1858.]

Mr. Claudet presented a new optical instrument of his invention, called the Stereomonoscope, by which, as its name implies, a single picture produces the stereoscopic illusion. In the centre of a large black screen there is a space filled with a square of ground glass, upon which, by some light managed behind the screen, is thrown a magnified photographic image representing a landscape, a portrait, or any other object. When we look naturally at that picture, with the two eyes, without the help of any optical instrument, an extraordinary phenomenon takes place: we see the picture in perfect relief as when we look at the two different pictures through a stereoscope. It is not necessary to be at a fixed distance from the picture: it may be examined as well at ten feet as at one foot, as an ordinary picture, without the least fatigue to the eyes. Although considerably enlarged by the instrument itself, we may magnify the picture still more by using large convex lenses; and two or three persons at once can examine it with the greatest ease, being able, while looking, to exchange any remarks, or express the sensations suggested by the picture,—an advantage

* From the London Athenæum, April, 1858.

which is denied by the use of the common stereoscope. By this remarkable discovery, Mr. Claudet has solved a problem which has always been considered as an impossibility by scientific men,—for the Stereomonoscope, by its very name, must sound like a paradox to the ears of all those who are versed in the knowledge of the principles of binocular vision, until they have had the opportunity of repeating the experiments by which the author has found a new fact which they had not noticed or explained before. This new fact is, that the image on the ground glass of the camera obscura produces the illusion of relief. But the phenomenon does not take place if the image is received on paper. When the medium is ground glass, the rays refracted by various points of the lens upon that surface, are only visible when they are incident in a line coinciding with the optic axes. So that the rays emerging from the ground glass, and entering the right eye, are only those which have been refracted obliquely in the same direction, by the left side of the object-glass; and those entering the left eye, are only those which are refracted by the right side of the object-glass: consequently, both eyes have a different view and perspective of the object represented on the ground glass, and the single image is, in point of fact, the result of two images, each only visible to one eye, and invisible to the other. This is the main point of Mr. Claudet's discovery, which cannot be fully understood without reading the paper which he communicated on that subject to the Royal Society, the 8th of May, 1857 (see *Proceedings of the Royal Society* for May, 1857,)* and without repeating the experiments described in that paper. The Stereomonoscope is founded on the same principles: it is nothing more than a camera obscura, before which are placed the two images of a stereoscopic slide, and by means of two object-glasses, sufficiently separated, the two images are refracted on the same space, at the focus of the camera-obscura on the ground glass, where they coincide. By the same laws we have alluded to before, the right picture is seen only by the left eye, and the left picture by the right eye; so that, although only one picture appears represented on the ground glass, each eye sees on the same spot a different picture having its particular perspective, and, consequently, in order to obtain a single vision, the eyes have to converge differently to bring consecutively in the centre of both retinas the different similar points of the two pictures according to their horizontal separation on the ground glass, the criterion of their respective distances. This alteration of the convergence of the optic axes, according to the distance of the various planes, gives the same sensation of relief we obtain when we look at the natural objects, or at their photographic representations. The invention of Mr. Claudet, in our opinion, is calculated to produce a revolution in the application of the splendid discovery of Prof. Wheatstone to the exhibition of photographic pictures. At all events, it is one of the most curious facts connected with modern discoveries in optics,—deserving the attention of philosophers and the admiration of the public.

* *Query*, June 18th, 1857. See preceding Article, page 54.

*On a new Construction of Furnace, particularly applicable where Intense Heat is required.** By Mr. C. William Siemens.

The high importance of the stores of combustible material which are distributed upon the surface of the earth, renders their wasteful expenditure and rapid diminution in quantity, in many parts, a serious subject for consideration; and, in the writer's opinion, there is no object more worthy of the earnest attention of engineers, and men of science generally, than that of causing the generation and application of heat to be conducted upon scientific and economical principles. Our knowledge of the nature of heat has been greatly advanced of late years by the investigation of Mr. J. P. Joule, of Manchester, and others; which have enabled us to appreciate correctly the theoretical equivalent of mechanical effect or power for a given expenditure of heat. We are enabled, by this new dynamic theory of heat, to tell, for instance, that in working an engine of the most approved description, we utilize at most only one-sixth to one-eighth part of the heat that is actually communicated to the boiler,—allowing the remainder to be washed away by a flood of cold water in the condenser. If we investigate the operations of melting and heating metals, and indeed any operation where intense heat is required, we find that a still larger proportion of heat is lost, amounting, in some cases, to more than 90 ℘ cent. of the total heat produced.

Impressed by these views, the writer has for many years devoted much attention to carrying out some conceptions of his own for obtaining the proper equivalent of effect from heat: some of the results he has obtained are known to the members of the Institution, amongst which are the regenerative steam engine and condenser, the regenerative evaporator, and an apparatus for the economic production of ice. The regenerative principle appears to be of very great importance, and capable of almost universal application; and the object of the present paper is to describe an application of this principle to furnaces of every description.

The invention of the regenerative furnace is due to the writer's brother, Mr. Frederick Siemens; and it has been matured and variously applied by the writer within the last few months. The result has, in all cases, been a large saving in fuel over the plans in common use, amounting to from 70 to 80 ℘ cent. of the total quantity of fuel hitherto consumed. The apparatus employed is moreover of a very simple and permanent description, and combines economy of fuel with other advantages, amongst which are the total prevention of smoke, and a general improvement in the quality of the work produced.

The furnace consists of a heated chamber, and of two fire-places or solid hearths, communicating respectively with the two regenerators. Each regenerator consists of a series of walls of fire-brick, laid in open Flemish bond, in such a manner that the pigeon holes of each wall are opposite the solid parts of the succeeding wall; the object being to form a number of zigzag or tortuous passages through the regenerators, leading to opposite sides of a valve, at the bottom of the chimney.

*From Newton's London Journal, April, 1858.

This valve consists of a rectangular box of iron, open at the two sides to the two regenerators, at the bottom to the atmosphere, and at the top to the chimney. A spindle passes through the centre of the two remaining close sides of the box, and carries a rectangular flap, or movable plate, fitting the box sideways, and bearing against one of its upper and one of its lower edges, according to the position of a tumbling lever and weight, fixed upon the valve spindle. When the valve is in either of its two positions, the atmospheric air, entering from below, passes through one regenerator, then over the adjacent fire-place, through the heated chamber, over the second fire-place, through the second regenerator, and, by the back of the valve, into the chimney.

A fire having been lighted, say, on the right-hand hearth, through a side opening, the flame passes through the furnace and through the second regenerator, to the chimney. In its passage through this regenerator, the first perforated wall that the flame strikes against will be heated to a considerable degree, the second wall to a lower degree, and so on in succession; the heat of the current being thoroughly exhausted by the time it reaches the chimney.

After about one hour's work, the position of the valve is reversed, and fuel is supplied to the second fire-place, which is then acted upon by a current proceeding in the opposite direction to that described. The cold atmospheric air comes in contact first with the least heated wall of the second regenerator, and then with the more heated walls successively, acquiring thereby a degree of temperature approaching the temperature of the heated current which previously entered the same regenerator. The heat thus imparted to the fresh air, greatly increases the temperature of the flame, which is now being produced upon the second or left-hand hearth; and consequently the nearest end of the first regenerator will be heated also to an increased degree,—the current reaching the chimney comparatively cool.

When the valve is again reversed, the fresh air will be heated nearly to the increased temperature of the hot end of the first regenerator, and will produce a still hotter flame with the fuel supplied to the first hearth. It is evident that, by a continuation of this process, an accumulation of heat, to any degree, may be produced within the furnace; provided only, the heat produced in combustion is greater than the heat lost by radiation, and the heat absorbed by the metal or other substances in the heating chamber.

In the regenerating furnace now described, the temperature at which the heat is communicated to the materials does not affect the quantity of fuel requisite, except so far as increased radiation is concerned; for the products of combustion pass away in all cases at a temperature not above 200° or 300° Fahr. This new principle of furnace is therefore applicable, with the greatest advantage, in cases where intense heat is required. It has been applied to furnaces for re-heating steel and iron, at the works of Messrs. Marriott & Atkinson, at Sheffield. One of these furnaces, after nearly three months' constant work, showed a saving of 79 ℔ cent. effected over the old furnace, in heating the same quantity of metal. Mr. Atkinson has also applied this principle of fur-

nace for melting cast steel, and obtained a still larger saving, although the new melting furnace has not yet been rendered entirely satisfactory for the workman.

The regenerative furnace has also been applied to the purpose of puddling iron; and although the new puddling furnace has been completed and worked only for a few days, at the works of Messrs. Rushton & Eckersley, at Bolton, the writer is able to state that it converts a charge of 480 lbs. of pig metal into wrought iron, with an expenditure of only 160 lbs. of common coal, as compared with 6 cwt. required in the ordinary furnaces: the net yield of wrought iron is higher than that of the ordinary puddling furnace, and the quality of the iron produced seems also to be superior. It is also worth mentioning, that the chimney of this puddling furnace may be watched for hours, and no trace of smoke will be seen issuing from it.

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Mr. ATKINSON said he had been working a re-heating furnace, altered to the new plan described in the paper, at the Fitzalan Steel Works, near Sheffield, during the last two months, in juxtaposition with a corresponding ordinary furnace; both having been built originally at the same time, and doing the same description of work,—heating cast steel bars for rolling and tilting. He was so much surprised at the great difference in the consumption of fuel by the two furnaces, that he had a particular account kept of the consumption of both during the course of a week, and found the total consumption of each in the six days, was 7 tons in the ordinary furnace, and only $1\frac{1}{2}$ tons in the altered one,—the work done by each being practically the same, and all circumstances alike during the time of comparison. He had also made a trial of the new plan of furnace, for melting cast steel, and obtained an equally favorable result as to economy of fuel; rather less than 1 ton of coke was consumed per ton of steel melted, instead of $3\frac{1}{2}$ to $4\frac{1}{2}$ tons per ton of steel, as required in the ordinary melting furnaces.

Mr. MCCONNELL was much struck with the beautiful principle involved in the new furnace, of making the currents of air circulate alternately in opposite directions, and thus effectually extracting the heat from the air, before it reached the chimney. He inquired whether it was found that the great alternation of temperature affected the durability of the brick-work, as the several portions were exposed to extreme variations of temperature; also, whether there was any difficulty in keeping the holes in the regenerator walls open and in repair, on account of the very high temperature to which they were exposed.

Mr. ATKINSON replied, that he had not experienced any practical difficulty from that cause; but, on the contrary, he found an important saving in the cost of brick-work repairs: for in the ordinary furnaces, the chimney had to be lined with fire-brick to a considerable height, in consequence of the intense heat of the air entering the bottom of the chimney; but in the new furnace, the heat was so completely extracted before reaching the chimney, that he could bear his hand on the flue, within a foot of the valve, at the base of the chimney, that regulated the alternation of the current; and not a single fire-brick

was now used in the chimney. In the regenerator portion of the furnace, there was no sign of want of repair at present, nor of slag from the melting of the bricks, and they appeared likely to last three times as long as they had done at present.

Proc. Insti. Mech. Engineers, London.

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*Proceedings of the Royal Scottish Society of Arts.**

Jan. 25.—*On an improved Stove for Heating Apartments, Greenhouses, &c.* By JAMES STARK, M. D., who entered into its description, and stated that it consisted of a cylinder of sheet iron, with an inner casing of cast metal rising the height of the top of the door, and within which alone the fuel was burned. The whole fire-place for the coals was below the opening of the door, while the cylinder rose high above it, and terminated in a flat top, on which was placed an iron plate containing water. A flue provided with a damper passed off at the back of the stove, close under the flat top. The cast iron box containing the ash pan was made close, so that the quantity of air which was admitted to the fuel might be under perfect regulation. The special advantages of this form of stove were—the absence of the usual burnt smell which prevails in apartments heated by stoves; the capability of regulating with the greatest accuracy the temperature of the apartment; the ease with which the stove was heated; the great economy of fuel, as it only required common Scotch dross of any kind; its cheapness; and its non-liability to get out of order or require repairs. The kind of stove shown had been used for a period of three years; and the inventor stated that an 8 inch stove, 30 inches high, had kept an apartment, 18 feet by 14 feet and 13 feet high, at a temperature of 63° during all the days when a fire was requisite, and that the average amount of fuel consumed annually was 1½ tons of common Scotch dross, value about 7*s.* 6*d.* Dr. Stark made some further remarks on heating and ventilating apartments.

On Explosions of Carburetted Hydrogen in Coal Mines, with the points to which we may look for their radical cure. By HENRY CADELL, Esq., Grange, Bo'ness.—The apalling accidents which frequently occur, Mr. Cadell remarked, were subjects of much painful interest, and for a number of years have been inquired into by committees of both houses of parliament, but without any decided effect in remedying the evil. He stated that much ingenuity had been shown in the improvement of ventilation of mines, and many appliances were adopted for driving or drawing air through them, and from the evidence given before the committees it appears, that in many cases these might be said to be carried to the verge of their capability. The various safety lamps in use, the principal being that by Sir Humphrey Davy, had been the means of bringing into operation mines which without such appliances would have been altogether unworkable; but it is allowed that since the introduction of these, accidents by explosion had rather increased

* From the Lond. Civ. Eng. and Arch. Journ., April, 1858.

than diminished, and as there were many contingencies by which these lamps might be injured, or made to communicate the flame to the explosive mixture, there could be no safety from explosions so long as these lamps were in the hands of hundreds of workmen; and he considered the only preventive was by keeping the workings at all times so aired as to be far removed from the explosive point, reserving safety lamps for special use in heading rooms and levels going before the body of the workings. In order to effect this in many workings, one of two things is requisite to render the ventilation so far complete as to dispense with safety lamps in the regular workings—either more shafts must be sunk, or a system of working adopted which may effect the same object; and as the former is frequently a subject of much difficulty, it is to the latter that he directed particular attention. The general methods of working coal may be classed under three systems, diagrams of which he exhibited: viz. 1. The pillar and room working, where rooms or excavations of from 3 to 6 yards wide are cut, leaving pillars of the coal for the permanent support of the superincumbent strata. 2. The panel wall system, where narrow excavations or rooms are made, leaving large panel-shaped pillars, which are afterwards partially taken out; and—3. The long wall system, where the whole coal is taken away progressively, roads being formed by removing a part of the roof or pavement, the superincumbent strata in this case settling down gradually as the workings progress, leaving a clear space along the face of the coal. In the two first-named methods there is a great face of coal exposed for the giving out of carburetted hydrogen, while a large open area is left for the gases to accumulate; while in the latter, or long wall system, there is the smallest amount of coal face exposed, and from the strata settling down as the workings progress, there is the smallest space left for the accumulation of gases; and the air course being along the faces, which are nearly in a line, is short and direct as compared with the other modes of working. He believed that what had been said would meet with little direct opposition, and found that so far these views were corroborated by the testimony of different engineers, at least for the purposes of general ventilation, and instanced the evidence given before a committee of the House of Commons, by Mr. Wynne and Mr. Landale, and the opinion of Hedley, in his book on the ventilation of mines. The principal obstacles to the general introduction of this system are its alleged expense, and apparent difficulty in high and clean seams; but these are matters more in idea than in practice, as in some parts they have been successfully overcome; and when properly introduced, the long wall system has generally been found preferable to the other modes of working, and has gradually been gaining ground. He concluded by repeating that what is to be looked to for safety from explosions, is a ventilation sufficient to keep the workings at all times remote from the explosive point; and with this view, where they are fiery and extensive, either more shafts should be sunk, or a method of working adopted which shall render easier and thereby improve ventilation, and that such is to be found in the long wall system of working.

Feb. 8. *On an improved Method of Graduating Hydrometers.* By Prof. ELLIOT, Queen's College, Liverpool.—After describing the usual method of graduation by accurately determining two points on the scale and dividing the intermediate space into equal parts, Prof. Elliot pointed out the erroneousness of that method in principle, and the serious deviations from truth to which it is liable in practice. He then demonstrated the true character of the progression which ought to exist in the lengths of the successive divisions. Prof. Elliot then proposed a geometrical process; by which the graduation might be effected with strict accuracy; and showed how that process might be rendered extremely easy when the instruments are constructed in quantities to be sold at a low price.

Description of a Check-Grieve for Registering Coal Sales by means of Machinery. By WILLIAM JOHNSTONE, mineral manager, Carron Company, Falkirk.—This machine is intended to be a check on the coal sales, and will prevent any suspicion between the salesman and his employer. It is simple, and easily understood. It consists of a disk in front with numbers engraved on the outer edge, with a pointer which is connected to two typed wheels, which are enclosed within a cover, where only a small opening is left in the cover for the salesman to put the ticket he is about to stamp into one of the typed wheels; and when he prints the required number of hundredweights on the carter's ticket, the other typed wheel is at the same time registering the same number of hundredweights on a strip of paper that the salesman has no access to, so that his employer can at any time compare the weight registered by the machine with the weight written in the sale books. The inventor stated that his machine by a slight alteration could be made to be useful in large drapery establishments, for receipting and registering the sale of goods.

Feb. 22.—*Improved Cottage Window Frame.* By Hon. Lord MURRAY. The object in view was to provide efficient ventilation without the several inconveniences of either the sash or the hinge principle, so often objected to as entailing much trouble or frequent repairs; and this is effected by making one-fourth of the window slide horizontally, in so simple a manner that while it allows perfect adjustment in quantity of opening, there is hardly any possibility of the arrangement getting out of order. The invention was exhibited in the shape of a wooden model, as well as of a full-sized cast iron window frame with sixteen small panes. The moulds being preserved at Shott's foundry in Leith-walk, further copies if required may be had.

On Photographical Illustrations for Books. By Professor C. PIAZZI SMITH.—After alluding to past attempts, attended with more or less success, to produce copies of photographs for publication, the author referred to the illustration of his recent work on "Teneriffe," published by Mr. Lovell Reeve, of London, as an example of a large impression of a book illustrated with pure photographs. The requisite number of copies had been procured by adopting the principle of printing from *secondary* negatives, so that several printers could be employed at once. Further advantage had followed from this method, for the second

negatives gave pictures of far more intensity than the first; and in one instance the original picture had been an opaque positive, backed up with black varnish; and as such generally supposed incapable of being multiplied. Its repetitions, however, produced by a process which the author described at length, from Plate 18 of the book. If any further difficulty occurred in supplying the public with copies of the work as fast as they were ordered, it arose chiefly in getting experienced mounters, each photograph having to be pasted on a plate card, and each book having forty such mountings. This delay and trouble must yield in time, if the public approve of photographic illustrations; and in such case a new field will be opened up to employ the ill-paid class of seamstresses in large towns.

Registering Frame for Printing Chromo-Lithographic Plates. By R. Burn, Engineer, Edinburgh.—This improvement consists in the construction of the hinges, which are made in such a way as to provide against any injury being sustained by them from the pressure put upon the lithographic press when the carriage is passing the scraper-bar; registering machines having hitherto been constructed with hinges quite flat on both sides; whereas, Mr. Burn's frame would, on examination, be found to have the bottom part tapered, and so constructed that any amount of pressure to which it may have to be frequently subjected will leave it uninjured.

March 8.—An experiment showing the *Contraction of Water above the Freezing Point.* The water operated on was contained in a glass jar, about 4 inches in diameter and 18 inches high; and the changes in its density were shown by the ascent and descent of colored glass balls about an inch in diameter. When the water was ice cold the balls were all at the bottom; but gradually, as the warmth of the room was communicated to the water, its contraction and consequent increase of density caused the balls to rise. As the water approached the state of greatest density, the heavier balls were seen to move irregularly about, in consequence of the current caused by the changes of temperature. In the course of an hour, the point of maximum density having been passed, the balls began to descend in reverse order, and at last all again reached the bottom. Mr. Sang added, that although he had never seen any published description of this experiment, he could scarcely expect it to be new, seeing that it is an obvious extension of a well-known method for demonstrating the compressibility of water.

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*The Production of Aluminium.**

M. Petitjean, a French chemist, resident in London (the inventor of an admirable method of silvering mirrors cheaply, which was brought to the notice of the Royal Institution some time since by Professor Faraday), has effected an improvement in the production of aluminium, which promises to still further reduce the cost of that valuable metal beyond all that has hitherto been anticipated. His invention consists in trasforming so much of the aluminium as is present in the substances with which it is found naturally combined into one or more sulphu-

* From the Mechanics' Magazine, March, 1858.

rets; and then removing the sulphur therefrom by the aid of carbon, or a hydro-carbon, or of a suitable metal or metals, mixed therewith, and exposed in a crucible to a high temperature, after which the aluminium in a metallic state will be deposited in the crucible. The process is equally applicable to the production of magnesium.

Study of the Thermo-multiplier. By M. F. DE LA PROVOSTAYE.

This instrument, valuable to the experimentalist for its extreme delicacy and for its extensive scale, has been the object of careful theoretic and practical study by M. de la Provostaye, whose results as reported to the Academy of Sciences at Paris, may be summed up as follows: First, as to the galvanometer.

1. Whatever may be the position of the needles, the forces which act upon each half are reducible practically to one, perpendicular to the plane of the meridian.
2. That the amount of deviation makes but a slight change in the amount of this resultant: hence, the apparatus may be regarded as a tangent-needle of a very considerable degree of perfection.

Secondly, as to the thermo-electric pile.

1. The progress of heating the thermometer takes place by the same degrees and in the same time, as if it were placed in a space at the constant temperature which the pile attains under the influence of the source of heat.
2. When the rise of the temperature is sufficiently small, if we withdraw the calorific action, it cools again in the same time and by the same degrees as if heated.

Thirdly. He determines the integral expression for the movement of the needle; shows that its position of rest under the action of the current is proportioned to the constant quantity of the current when the anterior face of the pile has assumed a stationary excess of temperature, and to the intensity of the incident heat: and then derives expressions for the times corresponding to the maximum and minimum excursions of the needle, and the extent of these excursions; and terminates with the following observation: "If, after making an observation with the thermo-pile in the common way, and awaiting the fixed deviation of the needle, the screen is replaced, the energy of the current diminishes and the needle returns to zero. I have found that the retrograde motion of the needle, counted from the fixed deviation, takes place by oscillations of the same extent and times as the primitive motion counted from zero.

Wooden Church, Paris.

The novelty of a Gothic church, all constructed of white wood, steeped in some antiseptic preparation to render the timber incorruptible, can now be seen near the Boulevard Mont Parnasse, at the Caen and Nantes station. Its best recommendation is its wonderful economy. "Notre Dame des Champs" will be inaugurated next Sunday.—*Globe Paris Correspondent.*

*Researches upon Cochineal.** By M. SCHUTZENBERGER.

Manufacturers of printed cottons have long known that cochinea when left for several days in contact with an aqueous solution of ammonia, undergoes an interesting modification which has not yet attracted the attention of chemists. The red coloring matter (carminic acid) passes to the state of a matter of a fine violet color, which acids do not modify, or cause to become red. This body cannot, therefore, be regarded as carminate of ammonia. To ascertain the transformation that takes place, I analyzed some carminic acid, upon the purification of which I had bestowed the greatest care, and modified this acid by means of ammonia. By the comparison of the two results obtained, I found that the coloring matter of the ammoniacal cochineal was the amide of carminic acid. On analyzing carminic acids prepared by different processes, I found that each had a different composition, but all my analyses might be definitively represented by the same formula with more or less oxygen, and I concluded therefrom that there exists at least two degrees of oxidation of carminic acid. I have in fact succeeded, by employing ether mixed with more or less alcohol as a solvent, in separating and obtaining in a crystalline form two products, of which one is represented by the formula

$$C^{18} H^{8} O^{10},$$

and the other by

$$C^{18} H^{8} O^{14},$$

as well as two intermediate degrees of oxidation, one

$$C^{18} H^{8} O^{12},$$

the other

$$C^{18} H^{8} O^{13},$$

which may be regarded either as peculiar bodies, or as compounds of the more oxidized with the less oxidized acid. By heating a mixture of carminate of soda and iodide of æthyle to 257° F. in a closed tube, I have obtained the ethers of these carminic acids in the form of red bodies, insoluble in water, but soluble in alcohol.

I have also remarked that nascent hydrogen completely decolorizes a solution of carminic acid, and that the color returns in the air. This reaction may be compared with that which takes place when indigo is reduced.—*Comptes Rendus*, January 4, 1858, p. 47.

* From the London Chemical Gazette, No. 368.

FRANKLIN INSTITUTE.

Proceedings of the Stated Monthly Meeting, June 17, 1858.

John C. Cresson, President, in the chair.
John Agnew, Vice-President.
John F. Frazer, Treasurer.
Isaac B. Garrigues, Recording Secretary. } Present.

The minutes of the last meeting were read and approved.

Letters were read from the K. K. Geologischen Reischsanstalt; Vienna, Austria, and the Royal Geographical Society, London.

Donations to the Library were received from the K. K. Geologischen Reischsanstalt, Vienna, Austria; the Royal Geographical Society, the Royal Institution, and the Royal Astronomical Society, London; La Société d'Encouragement pour l'Industrie Nationale, and L'Ecole des Mines, Paris, France; Major William H. Emory, U. S. Army; the O'Fallon Polytechnic Institute, and the Academy of Science, St. Louis, Missouri; Dr. B. H. Rand, William J. Young, Esq., and Prof. John F. Frazer, Philadelphia.

Donations to the Cabinets were received from John P. Whipple, Chief Engineer, U. S. Navy, and Dr. Charles M. Cresson, Philada.

The Periodicals received in exchange for the Journal of the Institute, were laid on the table.

The Treasurer read his statement of the receipts and payments for the month of May.

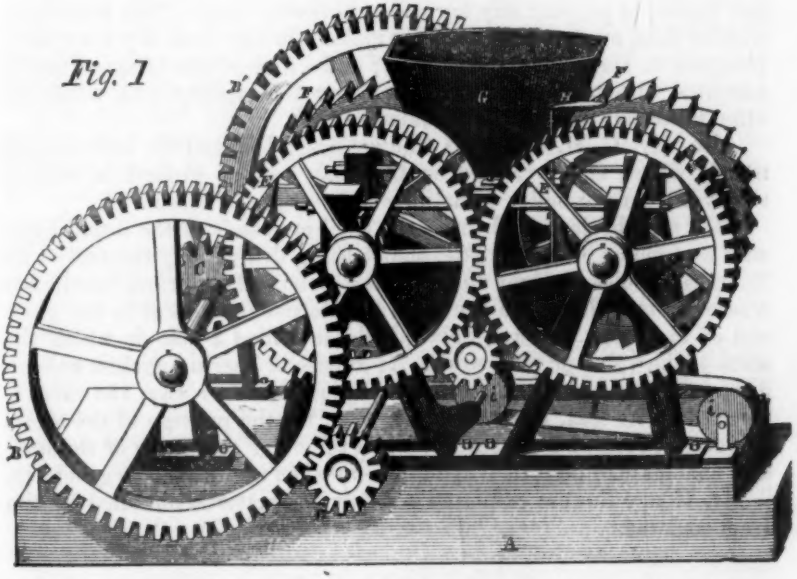
The Board of Managers and Standing Committees reported their minutes.

The Board of Managers reported, that at their last meeting they elected Lieut. Col. James D. Graham, U. S. Topographical Engineer, a corresponding member of the Institute.

Candidates for membership in the Institute (4) were proposed, and the candidates (6) proposed at the last meeting were duly elected.

W. Jones exhibited Wagner & Harper's Brick Machine, the invention of I. Z. A. Wagner, of Philadelphia, of which the cuts are an illus-

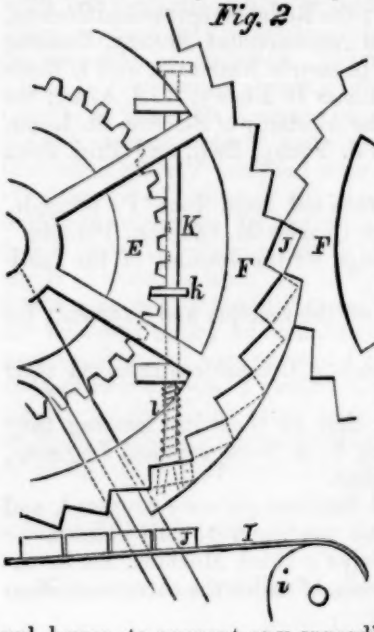
Fig. 1



tration. It consists of two mould-wheels, FF, with serrated faces,

working in journals, and rotating at the same speed by means of the coupling wheels, EE. The indentations of the mould-wheels come opposite each other as they successively fall in the lines joining the axles of said wheels, and form a rectangular box, as shown at J, of the brick size. A hopper G, fits over and on the sides of the mould-wheels, into which is fed the clay in its natural untempered condition; its gravity causes it to fall into the space between the wheels, which, in their rotation, compresses it, expelling the air, and by their continuous movement, carry the formed brick down towards an endless belt I, running over two pulleys, *i i*, driven by gearing. Upon this belt the bricks are delivered, their adhesion to the moulds being broken by the action of the apparatus K, worked by the tappets of the wheel E, striking upon the trigger K. *l* is a spring to elevate the rod after each depression. B, B′, C, D, are gear wheels; A is the timber foundation. Strong brace bolts *t t*, pass from side to side of the frame close to the journal boxes, to prevent any spreading between them. This machine is simpler than many others used for making bricks from dry clay, as no plungers or stampers are employed; and a higher rate of speed can be admitted without danger, the limit being the rapidity with which the attendants can remove the moulded bricks.

Fig. 2



Also, Mr. C. M. Cresson's Gauge Cocks, designed for boilers using muddy water, and arranged so that they can be ground in without removal from the boiler while under a pressure of steam.

They may be described thus: the shell or case is of the usual shape, with a globular extremity, the shank being drilled longitudinally with the escape holes at right angles in the globe end. A crank handle has a screwed spindle, which works in an internal thread cut in the globe end of the cock; through this spindle, is drilled a hole in which the stem of the valve or plug works, its inner end bearing against a shoulder; consequently, when the handle is turned either way, the valve is forced into its seat, or permitted to open for the passage of the steam or water. A milled head secured upon the outer extremity of the spindle, enables it to be turned upon the seat when required to be ground in.

Mr. Henry Bowers exhibited a red dyeing material obtained by him from coal tar.

COMMITTEE ON SCIENCE AND THE ARTS.

The Committee on Science and the Arts constituted by the Franklin Institute of the State of Pennsylvania, for the promotion of the Mechanic Arts, to whom was referred for examination, "an Adjustable Eccentric for Operating Slide Valves of Steam Engines," invented by Mr. S. LLOYD WIEGAND, of Philadelphia, Pennsylvania,

REPORT:—That it consists of a strap and eccentric block of the usual form mounted upon a sleeve, fitted with two feathers on opposite sides and in line with each other, but at an angle with centre line of sleeve and main shaft. Suitable gear is attached to the sleeve to move it endways upon the shaft, (with which it rotates,) and to hold it at any required point of its travel. The eccentric block fits snugly upon the feathers, but does not touch the sleeve at any point, the centre hole or eye being made oval to clear the sleeve as it approaches the latter, by sliding upon the inclined feathers.

The eccentric does not move sideways with the sleeve, but is kept in place by guards on each side, or by a cross bar passing through the shaft and having its ends secured to the eccentric block. In the latter plan, the sleeve is slotted to permit its motion by the bar. The eccentric block is so made that its throw is equal to the lap of the slide valve, and when mounted, and midway upon the sleeve, its centre falls in a plane passing through the centres of the sleeve, the feathers, and also, when the valve gear is direct acting, through the centre line of crank.

The throw necessary to give the required travel to the valve, is had by moving the sleeve through the eccentric, causing it to move up the inclined feathers, and thereby increase its centre from the centre of rotation, thus an amount of steam opening ranging from nothing to full open can be obtained.

From this, and the accompanying description and drawings, it will be seen that when the sleeve is shifted either way, the centre of the eccentric moves in a line at right angles to this plane, consequently, the lead of the valve is constant, or nearly so, a slight variation occurring from the obliquity of the eccentric rod, but it is exactly equal for each two opposite points equidistant from the plane; therefore, an engine fitted with this gear will run either ahead or back, as the eccentric is disposed, and the steam can be cut off at any point of the stroke.

In comparing this valve gear with others intended to accomplish the same purpose, the committee consider its merits equal to the best known to them, and that it performs the same functions with fewer parts and wearing surfaces. The committee are aware that a design similar to this was patented in Great Britain, (see Isaac Dodd's specification, No. 2605, British Patents for 1854,) but it was defective in not giving lead in backing, an important feature believed to be peculiar to this now under consideration.

From the amount of space necessary to get the motion of the sleeve, the committee think this plan will not be applicable to all forms of marine engines, but on locomotive engines, where the entire space on the

axle between the cranks or the journals can be appropriated, it is well suited, and it is recommended to the favorable notice of locomotive manufacturers.

By order of the Committee,

Philadelphia, May 13th, 1858. WM. HAMILTON, *Actuary.*

Description by S. LLOYD WIEGAND.

A pair of clamps, FF, are secured upon the shaft A, by means of the bolts and nuts GG; forged in the same pieces with the clamps are projecting guides, EE, which project radially from the clamps, and are finished with their sides perfectly parallel. The eccentric, B, has cast upon its sides four projections, O, O, O, O, which fit upon each side of the guides EE; a plate, H, is secured by bolts, II, across each of the guides, so that the eccentric can slide transversely across the shaft, the hole in the eccentric being of such a size and form as to permit it. Between the bolts GG, and the shaft A, are two slides CC, made concave upon one side so as to adapt them to the form of the shaft, and upon the other side of slides CC, are fixed oblique feathers DD, which are parallel to each other, and fit in correspondingly oblique grooves in the eccentric. The slides CC, are firmly attached to a collar J, by which they may be made to slide lengthwise of the shaft, and in so doing,

Fig. 1.

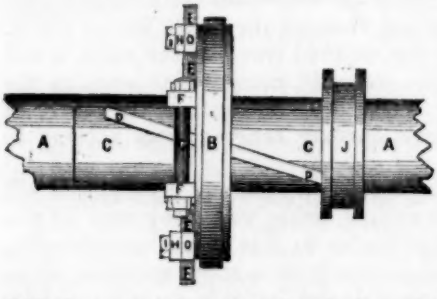
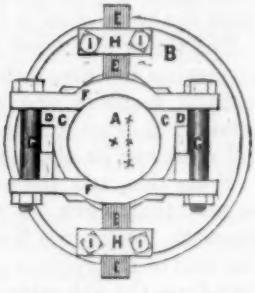


Fig. 2.



shift the eccentric across the shaft, and thus to give motion to the slide-valve of a locomotive engine, for either a backward or a forward motion, or any intermediate extent of motion of the valve, so that the slide-valve performs the functions of a cut-off valve, in the same manner as when operated by the shifting link motion of Stephenson. The eccentric, it will be perceived by reference to fig. 2, has the opening through which the shaft passes, made to one side of the centre, so that it is permanently eccentric in a direction at right angles to that in which its throw is varied; the dark cross represents the centre of the shaft, and the dotted line indicates the direction in which the centre of the eccentric moves when the throw is varied or reversed.

This permanent eccentricity is requisite to move the slide-valve to such a position, that it shall supply steam promptly at the commencement of each stroke of the piston, and toward the completion of each stroke it has the effect of cutting off the steam, by bringing the lip of the slide-valve over the steam port.

The relative positions which the centre of the eccentric assumes to the centre of the shaft and the line of the crank, may be seen in fig. 4; L is the shaft centre, LM the centre line of the crank, K is the centre of the eccentric when the valve has its full travel in forward motion, K′ is the eccentric centre when the valve has its full travel in backward motion, N is the position of the eccentric when in mid-gear, or set for neither forward or backward motion; when in this position the valve has a motion just sufficient to bring the edge of the valve to the edge of the steam port, but not sufficient to pass any steam into the cylinder. The distance between L and N is equal to the lap of the slide-valve, that is, the amount that the valve-lip exceeds the width of the steam port, assuming that the valve-rod is connected without the intervention of a rocker to the eccentric; when a rocker is used, the proportion of LN and KK′ must be varied according to the relative length of the rocker arms. The extent and direction of the throw of the eccentric can be

Fig. 3.

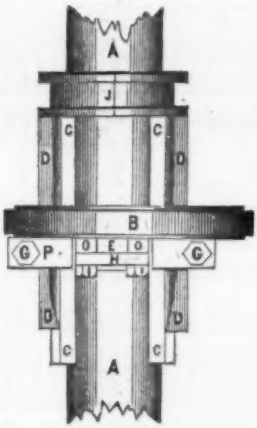
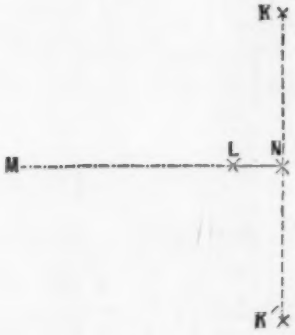


Fig. 4.



controlled by the engineer operating a lever which slides the collar J lengthwise of the shaft, while the engine is in motion or at rest, and a variable expansion is thus effected.

The slides of the eccentrics of both engines of a locomotive being both attached to one collar, are operated simultaneously by the engineer.

The advantages possessed by the arrangement are:

1st. That it is lighter than any other variable expansion gear.

2d. That it is simpler than any other.

3d. It gives steam more accurately than a shifting link-gear, by avoiding any angular variation, caused by the rising and falling of the eccentric rods.

4th. It is cheaper to construct than any other valve motion.

5th. Wear in any of its wearing parts can be compensated for by merely tightening the joints, without replacing any of the parts.

6th. It occupies less space than any other variable expansion gear, so that the boiler can be set lower, and the arrangement of the other parts of an engine varied to an extent inadmissible where the shifting link-gear is employed.

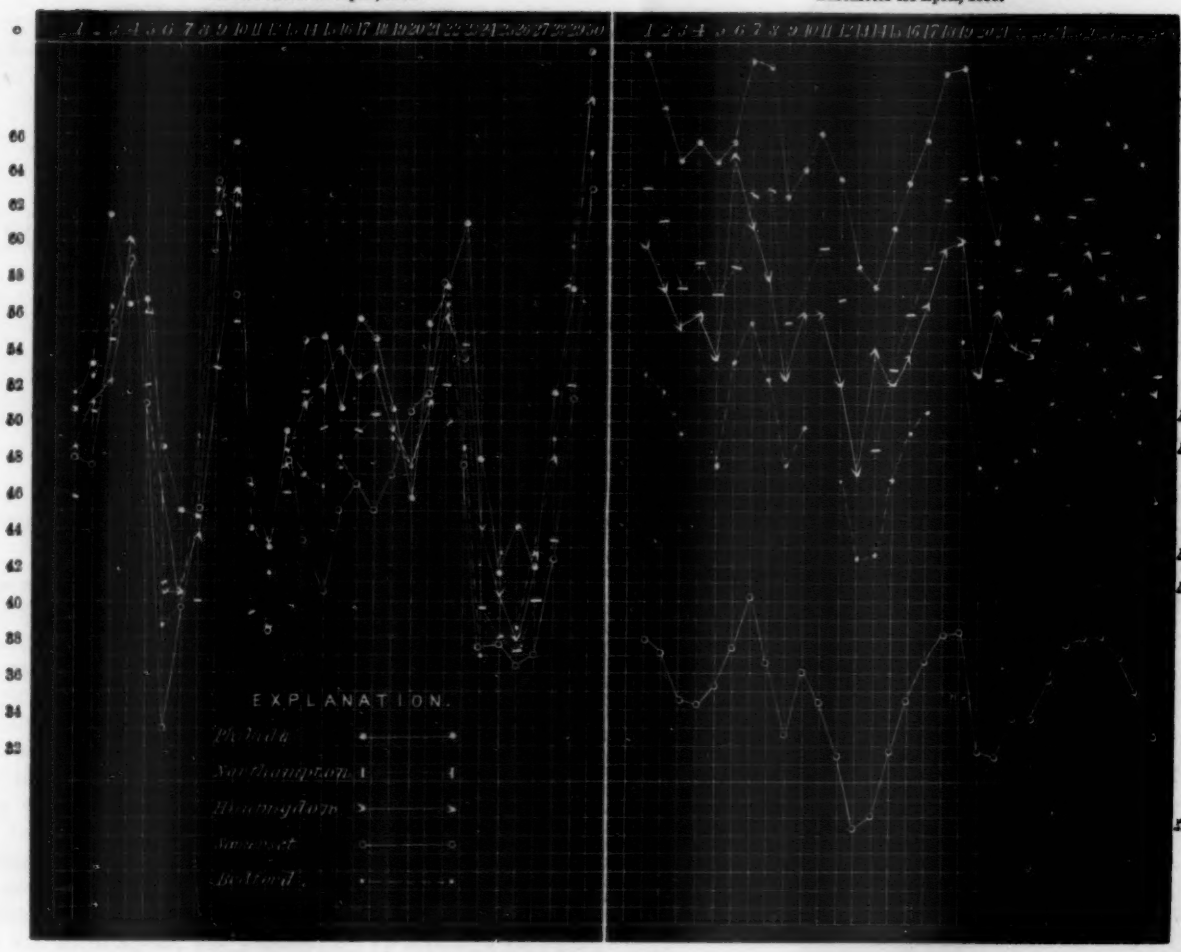
Abstract of Meteorological Observations for April 1858; made in Philadelphia, Northampton, Somerset, Bedford, and Huntingdon Counties, Pennsylvania, for the Committee on Meteorology of the Franklin Institute.

April, 1858.	PHILADELPHIA.—Lat. 39° 57′ 28″ N. Long. 75° 10′ 28″ W. Height above the sea 50 feet. Prof. J. A. KIRKPATRICK, Observer.									EASTON, Northampton Co.—Lat. 40° 43′ N. Lon. 75° 16 W. Height above the sea about 340 feet. SELDEN J. COFFIN, Observer.						SOMERSET, Somerset Co.—Lat. 40° N., Lon. 79° 3′ W. GEO. MOWRY, Observer.				BEDFORD, Bedford Co. SAMUEL BROWN, Observer.			HUNTINGDON, Huntingdon County. JACOB MILLER, Obsr		
	Barometer.		Thermometer.			Relative humidity. 2 P. M.	Force of vapor. 2 P.M.	Rain.	Prevail'g winds.	Bar.	Ther.	Relative humidity. 2 P.M.	Force of vapor. 2 P.M.	Rain.	Prevail'g winds.	Bar.	Ther.	Rain.	Prevail'g winds	Bar.	Ther.	Prevail'g winds.	Ther.	Rain.	Prevail'g winds.
	Mean.	Mean daily range.	Mean.	Daily oscillation.	Mean daily range.					Mean.	Mean.					Mean.	Mean.			Mean.	Mean.		Mean.		
	Inch.	Inch.	°	°	°	Per ct.	Inch.	Inches.		Inch.	°	p. c.	Inch.	Inch.		Inch.	°	Inch.		Inch.	°		°	Inch.	
1	30·015	·049	50·8	24	1·7	25	·149		E S E.	29·650	45·7	22	·115		S E.	27·704	48·0		S.	29·147	51·3	S E.	48·3		S.
2	29·871	·143	53·2	19	3·7	51	·283		N E.	29·540	50·2	43	·225		S E.	27·673	47·7		(var.)	29·092	52·7	S E.	51·0		E
3	29·720	·151	61·3	23	8·2	40	·310		N E.	29·363	54·3	30	·194		(var.)	27·546	55 3		S.	28·906	56·3	N W.	52 3		(var.)
4	29·780	·059	56·5	20	5·5	32	·240		N E.	29·443		42	·209		S E.	27·632	59·0	0·448	S.				60·0	0·404	S.
5	29·728	·066	56·8	16	5·7	46	·302	0·033	S E.	29·343	52·0	45	·275	0·05	(var.)	27·570	51 0		W S W.	28·898	56·0	S W.	55·7		W.
☽ 6	29·777	·101	48·5	14	11·7	38	·139		N W.	29·437	40·7	36	·100		N W.	27·696	33·3		W.	29·161	38·7	N W.	40·7		N W.
7	30·001	·224	45·0	21	6·8	23	·089		N W.	29·623					N W.	27·812	39·7		(var.)	29·279	39·7	N W.	40·7	0·034	N.
8	29·993	·042	44·8	8	4·5	61	·191	0·025	S E.	29·653	40·0	50	·148	} 0·54	S.	27·642	45·0	0·146	S.	29·118	47·3	S E.	43·7	0·388	S.
9	29·639	·354	61·3	29	16·5	62	·488	0·553	S W.	29·270	52·5	80	·427		(var.)	27·449	63·3	0·301	(var.)	28·874	63·0	S W.	62·3		W.
10	29·706	·118	65·5	22	8 5	28	·258		(var.)	29·377	55·8	34	·220		W.	27 607	57·0		W.	28·998	62·0	S W.	62·7	0·251	N
11	29 807	·110	44·0	16	21·5	61	·182	0·455	N E.	29·490	39·3	68	·151	} 1·35	(var.)	27·529	46·3	} 1·335	S S E.				46·3	0·960	E.
12	29·673	·134	43·0	5	1·0	92	·265	} 1·242	N E.	29·347	38·7	91	·225		E S E.	27·361	38·7		S E.	28·843	41·3	S E.	43·0	0·266	E.
● 13	29·411	·263	49·3	16	6 3	90	·368		N E.			91	·208		E.	27·178	47·7	0·054	S W.	28·612	48·7	(var.)	47·3	0·155	E.
14	29·377	·085	54·7	18	5·3	62	·371	1·077	(var.)	28·977	51·7	54	·283	0·03	S.	27·205	43·3	0·106	W.	28·637	47·0	S W.	51·0		E.
15	29·540	·163	54 7	13	2·7	49	·255		N W.	29·150	49·7	43	·181		W.	27·391	40·7	0·180	W.	28·846	46·3	N W.	52 0		W.
16	29·667	·127	50·8	11	3·8	86	·348	0·058	S W.	29·297	47·3	67	·249		W.	27·525	45 0	0·081	W.	28·960	48·0	N W.	54·0		N W.
17	29·792	·125	55·8	23	7·0	31	·195		W S W.	29·427	49·3	19	·097		W.	27·645	46·7		W.	29·077	46·7	S W.	52·3		W.
18	29·968	·176	54·7	16	2·8	40	·215	} 0·130	N E.	29·620	50·3	29	·146	} 0·64	W.	27·710	45·0	0·221	(var.)				52·7	0·139	S.
19	29·986	·051	50·7	6	5·3	66	·257		N E.	29·690					N E.	27·723	47·0		(var.)	29·213	49·0	S W.	49·3	0·131	E.
☾ 20	29·687	·303	45·7	3	5·0	84	·262	0 730	N E.	29·377		87	·223		(var.)	27·398	50·7	} 0·672	(var.)	28·871	47·3	S E.	47·7	0·468	S E.
21	29·505	·315	55·3	18	9·7	51	·283	0·018	(var.)	29·120					N W.	27·368	51·7		W.	28·841	53·0	N W.	52·0		W.
22	29·783	·278	57·2	20	3·2	29	·188		S.	29·413	52·0	54	·333		(var.)	27·480	57·3		S.	28·903	56·3	S E.	55·7		S.
23	29·509	·214	61·0	23	6·5	62	·488	0·288	S E.	29·240	54·5	50	·312	0·33	W.	27·485	47·3		W.	28·930	48·3	N W.	53·7		W.
24	29·788	·220	47·8	18	13·2	38	·162		W.	29·420	39·5	54	·169		N W.	27·592	37·3	0·030	W.	29·058	37·0	N W	44·0		W.
25	29·936	·148	41·2	8	6·7	56	·162		W.	29 573	38·0	37	·118		W.	27 684	37·7		(var.)				40·3		N.
26	29·975	·039	44·0	21	5·5	33	·125		N W.	29·627	37·2	23	·066		N.	27·706	36·3		N W.	29·213	38·3	N W.	38·0		N.
○ 27	29·883	·141	41·8	12	3·8	33	·102		N E.	29·470	39·7	21	·063		N W.	27·710	37·0		N W.	29·150	41·3	N W.	42·7		N.
28	29·770	·063	51·7	21	9·8	24	·126		W.	29·407	43 3	14	·055		(var.)	27·675	42 3	0·036	(var.)	29·085	49·0	N W.	47 4		W.
29	29·723	·047	57·7	27	6 0	33	·216	0·072	W.	29·350	52·0	33	·165	0·18	W.	27·553	51·3	0·137	S W.	28·951	59·7	S W.	57·3	0·057	W.
30	29·519	·204	70·7	29	13·0	37	·432		S W.	29·143	65·0	49	·422		W.	27·438	63·0	0·212	W S W.	28·793	64·3	W.	67·3	0·145	W.
Means	29·751	·150	52·5	17	7·0	49	·248	4·681	N 31° E.	29·419	46·9	47	·199	3·12	N 80° W.	27·553	47·1	3·959					50·4	3·398	

Comparison of the Thermometric and Barometric Means of Philada., Northampton, Somerset, Huntingdon, and Bedford Counties.

Thermometer for April, 1858.

Barometer for April, 1858.



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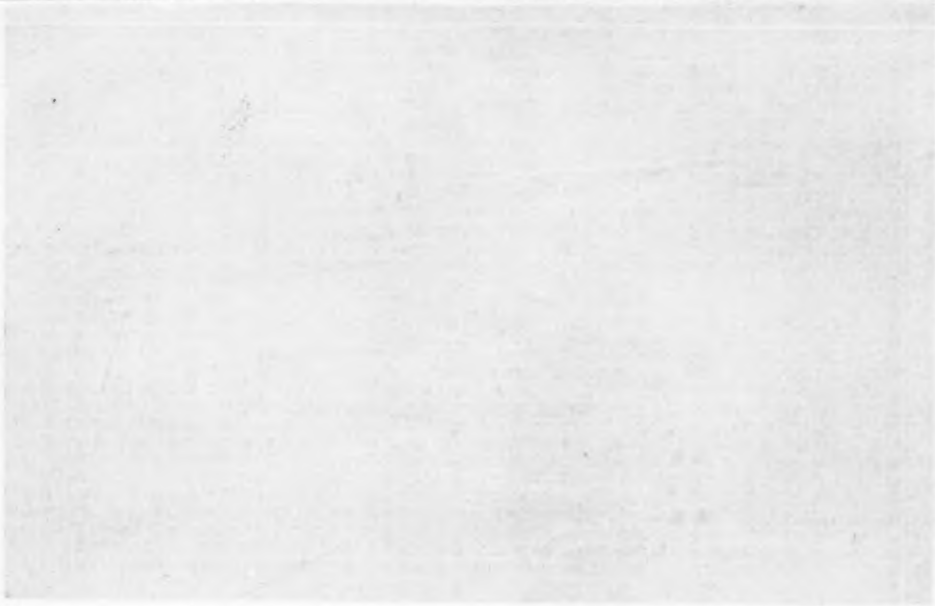
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